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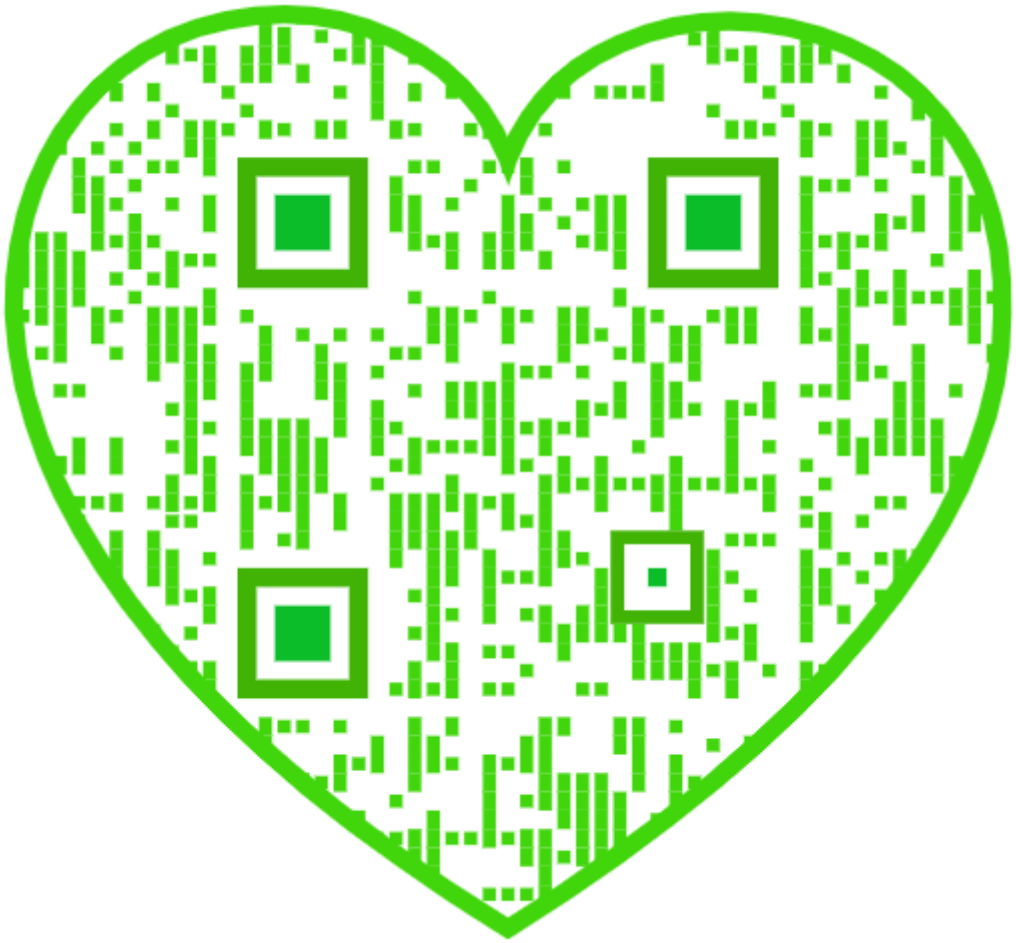

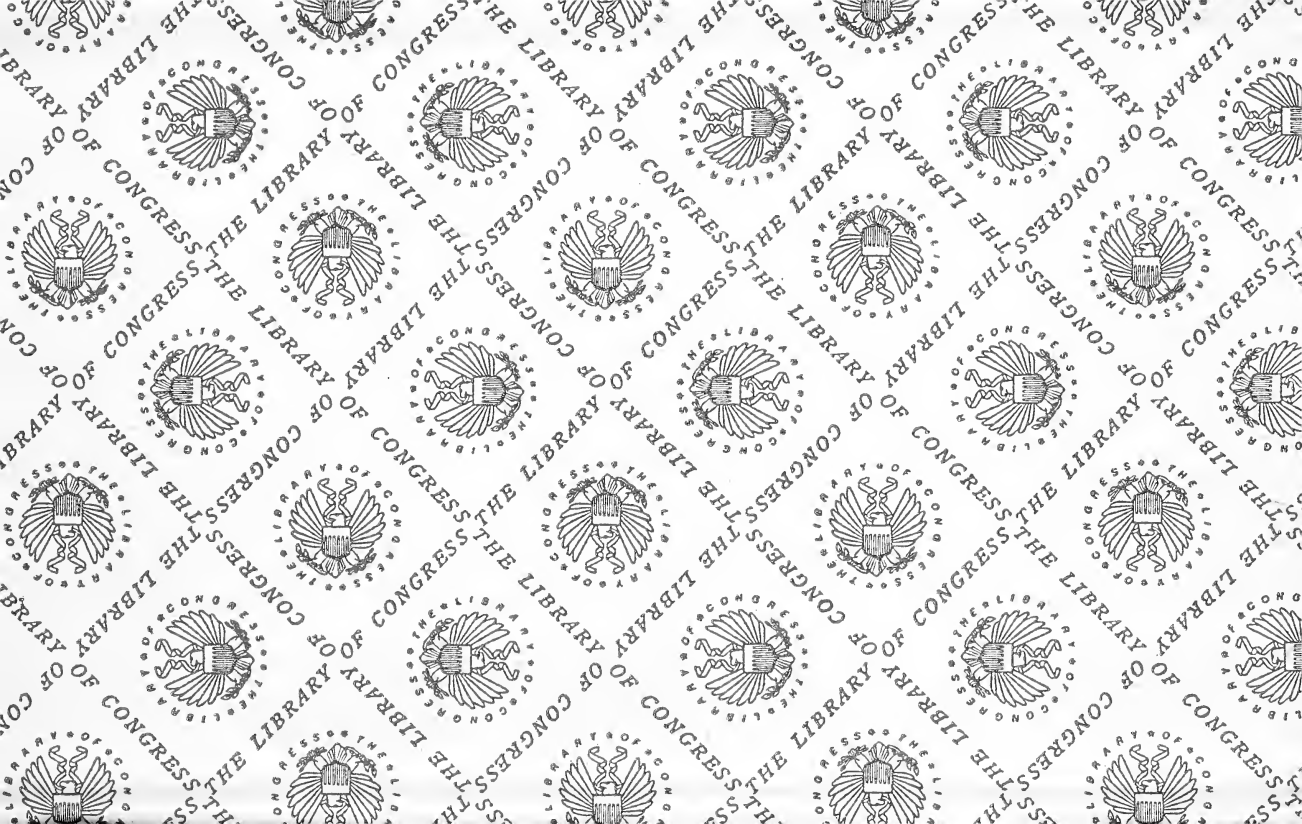
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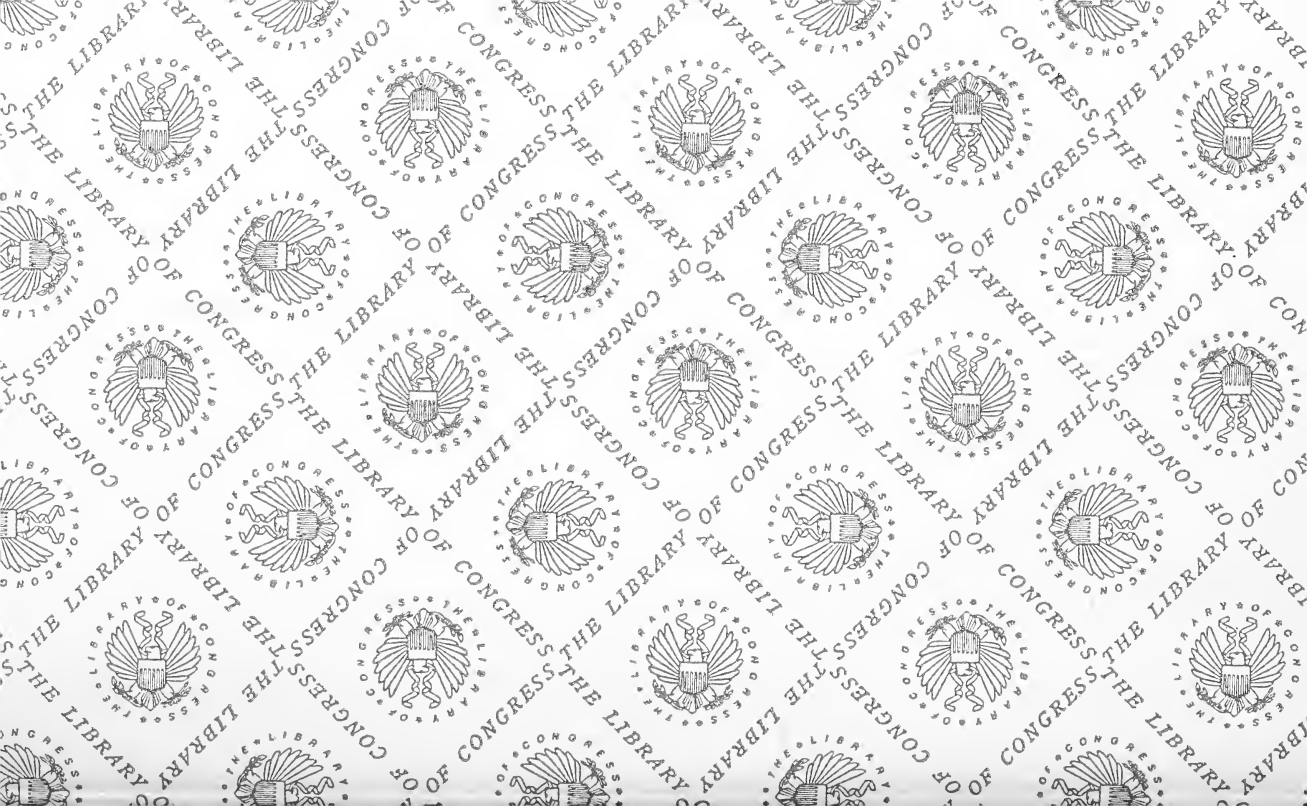
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SHEEP-FARMING IN NORTH AMERICA

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SHEEP-FARMING
IN
NORTH AMERICA

BY THE LATE

JOHN A. CRAIG

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PREFACE

No branch of animal husbandry has passed through so many serious changes in the last century as has the sheep-raising industry. Established, and for many years continued, with wool as the main object, the successive changes have seemed to make the mutton side of sheep-raising more and more important.

The more comprehensive books upon sheep emphasized wool-production and were largely devoted to diseases. The present volume considers the sheep as having an important place or part in intensive stock-farming. American farmers, as a rule, are not prepared to give sheep the attention they will repay, or that is necessary if the possibilities of employing them in the utilization of high-priced lands are to be realized. The range areas devoted to sheep are diminishing, and, as the industry comes to have a more stable position on general farms, the supplies and market prices may be expected to be more uniform than in the past.

While he was Professor of Animal Husbandry at the University of Wisconsin, Professor Craig outlined and wrote part of this work, assisted by the

late William Watson. In subsequent years, he added to the work the results of his investigation and wide observations in many parts of the United States. The volume planned by Professor Craig was to have been more exhaustive than the present one, and was to have contained a number of chapters pertaining to the breeding and handling of sheep on the range. As it now appears, the volume contains many practical ideas that are the outcome of developments of recent years and are not found elsewhere in book form. In the final preparation the endeavor has been to preserve the author's peculiar faculty of arousing interest in the study of the sheep and for showing the possibilities to be realized from working with them.

Chapters II, XII, and XV are the work of Dr. H. P. Miller, of Sunbury, Ohio, who has had extensive experience with all phases of the shepherd's work, and is a recognized authority on the ailments of sheep.

To put the copy into final shape and arrange the illustrations has been the pleasant work of the undersigned.

F. R. MARSHALL.

University of California.

CONTENTS

CHAPTER I

	PAGES
Position of Sheep in Profitable Farming	1–9
Natural Conditions for Sheep	1
Combining Wool and Mutton	3
Lands for Sheep	3
Sheep for Intensive Farming	4
Peculiar Advantages in Sheep-farming	6

CHAPTER II

Sheep Farms and their Equipment	10-19
Number of Sheep to Farm	13
Buildings	13
Racks and Troughs	16
Watering Troughs	18
Fencing	18

CHAPTER III

Breeds of Sheep	20–48
Habits of Sheep	21
Ancestry of Present-day Sheep	23
Early Sheep-breeding in Europe	25
Formation of Breeds	27
Classification of Breeds	28
Classification according to Face Color	28
The Wool as a Basis for Classification	28
Classification based on being Polled or Horned	29
Classification based on Altitude	29
Influence of Altitude	30

PAGES

Adaptability of the Breeds 33
Effect of Altitude on Type 35
Effect of Altitude on Size 35
Climatic Influence on Wool 37
Influence of Food on Wool 38
Effect of Soil on Wool 39
Establishment of American Sheep-breeding . . 40
Improvement in America 42

The American Merino 43
Classes of American Merino 44

French Merinos 46
The Rambouillet 46

CHAPTER IV

British Breeds of Sheep 49–134

The Leicester Sheep 51
The Old Leicester 51
The Work of Bakewell 52
Appearance of Leicester 54
Mutton Qualities of Leicester 54
Characteristics of the Leicester Fleece . . . 55
Value for Feeding Purposes 56
Breeding Qualities 56
Adaptability 56

The Border Leicester 57
Standard for Border Leicester 58
Differences between the Leicester Varieties . . 59
Value of Border Leicester for Crossing on Hill Sheep 60
Crossing on Fine-wooled Sheep 60

The Cotswold 61
Home of the Breed 63
Improvement of the Cotswold 63
Appearance of the Cotswold 64
Mutton Qualities 65
Wool-production 65

PAGES

Grazing Qualities 66
Qualities as Breeders 66
Value of Cotswolds for Grading 66

The Lincoln 67
Improvement of the Old Lincoln 68
The Type of Old Lincoln 69
Live Weights attained by Lincolns 70
Weight and Character of Fleece 70
Breeding Qualities of Lincolns 71
Adaptability 72
Value for Grading 72

Differences in the Lowland Breeds 73

The Southdown 74
Origin of the Southdown 75
Improvement of the Breed 77
Work of John Ellman on the Southdowns . . 77
Improvement of Southdowns by Jonas Webb . . 79
Appearance of Southdowns 81
Description of Ideal Southdown 82
Production of Mutton in the Southdown . . 83
Quality of Mutton 84
Qualities of the Fleece 85
Attributes as Breeders 85
Adaptability 86

The Shropshire 86
Original Sources of Shropshire 89
Improvement of the Early Shropshires . . . 91
Attaining the Status of a Breed 93
Type of Shropshires 96
Position as Producers of Mutton 99
The Quality of Shropshire Mutton 100
Qualities of the Shropshire Fleece 100
Characteristics as Breeding Stock 102
Utility for Crossing 103
Adaptability of Shropshire 104

The Hampshire 105
The Hampshire Foundation Stock 106
The Sources of Improvement of Hampshire . . 107

PAGES

Extent of the Hampshire Improvement . . . 110
Characteristics of the Hampshire 113
Mutton Qualities 114
Characteristics of Hampshire Fleece . . . 116
Attributes for Breeding Purposes 116
Adaptability of Hampshire 117

The Oxford Down 117
Formation of Oxford Down as a Breed . . . 118
Qualities desired by Breeders of Oxford Downs . 119
Recognition as a Breed 120
Characteristics of Oxfords 121
Mutton Qualities 122
Fleece Characteristics of Oxford Down . . . 123
Breeding Qualities 124
Adaptability of Oxford Down 125

The Suffolk 125

The Dorset Horn 127

The Cheviot 131

The Black-faced Highland 134

CHAPTER V

Formation of a Flock 135–146
Pure Breds *versus* Grades for Foundation Stock . 135
Selecting Foundation Stock 137
Breed Type 139
Judging Sheep 141
Deception in Form due to Trimming . . . 142
Quality 143
The Ram 143
The Ewe 144
Need of Uniformity in the Ewe Flock . . . 145

CHAPTER VI

The Improvement of the Flock 147–162
Selection of Rams 147

PAGES

Study of Pedigrees 150
Testing Rams 151
In-breeding and Line-breeding 153
Culling the Ewes 158
Developing the Lamb 159
Cross-breeding 160

CHAPTER VII

Autumn Management of the Flock 163–174
Sorting the Ewes 163
Age of Breeding Ewes 164
Dentition of Sheep 165
Breeding Yearling Ewes 167
Time of Mating 167
Need of having Stock in Good Condition . . 168
Advantages of Flushing Ewes 168
Ova produced by Ewes 171
The Ram in the Breeding Season 172
Number of Ewes to a Ram 173
Marking the Bred Ewes 174

CHAPTER VIII

Winter Management of the Flock 175–182
Division of the Flock for Wintering 176
The Breeding Ewes in Early Winter 177
Roughages for Ewes 178
Grain for Ewes in Lamb 180
Accessories to the Ration 181
Rations for Rams 181

CHAPTER IX

Spring Management of the Flock 183–201
Indications of Lambing 184
Trimming and cleaning Udders 184

PAGES

Delayed Lambing 184
Avoiding Disturbances of the Ewe 184
Assistance in Lambing 185
Natural Presentation 185
Wrong Presentation 185
Still-born Lambs 189
Removal of the After-birth 189
Possibility of a Second Lamb 190
Assisting the Lamb 190
Attention at Birth 190
Marking the Lambs 191
Weak Lambs 192
The Division of Ewes and Lambs 193
Dry Ewes 194
Treatment of Unkindly Ewes 194
Care of Twins 194
Hand-feeding Lambs 195
Foster Mothers 196
Feeding Grain to Lambs 196
Food Previous to Weaning 197
Quantity of Grain to Feed 197
Feeding Ewes that are Suckling Lambs . . . 198
Castration of Lambs 199
Docking the Lambs 201

CHAPTER X

Summer Management of the Flock 202–218

Salt and Sulphur 203
Fresh Water Required 203
Pasturing Horses with Sheep 203
Application of Tar 204
Shade in Pastures 204
Changing the Pastures 205
Guarding against Worms 205
Summer Grazing Crops 206
Weaning 209
Time for Shearing 212
Manner of Shearing 213

PAGES

Washing before Shearing 214
Place for Shearing 214
Tying the Fleece 215
Dipping 216

CHAPTER XI

WOOL 219–228
Density 219
Length of Staple 220
Examining the Fleece 221
Fineness 222
Shrinkage of Wool 223
Market Grades 223
Table showing Weight of Fleece, etc. 224

CHAPTER XII

EARLY LAMB RAISING 229–239
The Breeding Flock 230
Management at Mating Season 231
Management of Ewe and Lamb 232
Feeding the Lambs 234
Marketing the Lambs 235
Equipment for Butchering 236
Shipping 237
Docking and Castrating 237
Markets 238
Buildings 238
Floor Space 239

CHAPTER XIII

FATTENING SHEEP 240–261
Age at which to Feed Grain 240
Corn for Fattening Sheep 247
Oats 247

PAGES

Peas 248
Bran 248
Wheat 249
Barley 249
Soy Beans 249
Roughages for Fattening Sheep 249
Sorghum Hay 252
Silage 252
Fattening Lambs on Rape 253
Rape and Pasture 254
Precaution Necessary in Feeding Rape . . . 255
Shearing Lambs before Fattening Them . . 255
Shearing in October 256
System of Feeding 256
Essentials in Management 257
Quantity to Feed 257
Cost and Value of the Increase 258
Buying Sheep to Fatten 259

CHAPTER XIV

Preparation of Sheep for Show 262–277

Importance of Breeding 262
Time of Birth 263
Large Number Needed 263
Matching Sheep 263
Shed or Field Feeding 264
Attention to the Feet 265
Variety of Foods Required 265
Sustaining the Appetite 266
Feeding during Summer 266
Overfeeding Possible 267
How Smithfield Winners were Fed 268
How Chicago Winners were Fed 269
Use of Jackets 270
Washing before Trimming 271
Stubble Shearing 271
Trimming 271
Carding Fleece 272

PAGES

Frequency of Trimming 273
Oiling the Fleece 273
Firming the Fleece 274
Trimming Long-wooled Sheep 274
Treatment of Long-wooled Fleeces 274
Process of Felting 275
Coloring 275
Material used for Coloring 276
Aftertreatment of Show Sheep 277

CHAPTER XV

Diseases 278–298

Parasitism 278
Gid, Turn-sickness or Sturdy 278
Tapeworms of the Sheep 280
Intestinal Roundworms 281
Medicinal Preventives 282
The Stomach Worm 283
Lung-worms, Hoose, Husk 284
Grub in the Head 285
Catarrh 286
Dysentery, Scours 286
Constipation, Stretches 287
Colic 288
Abortion, Slinking 288
Eversion of Uterus, Casting of Withers . . . 289
Garget, Caked Udder 290
White Dysentery in Lambs 290
Joint-ill 291
Lamb Cholera 291
Calculi, Gravel 292
Entropia, Sore Eyes 293
Pink Eye 294
Goiter 294
External Parasites 294
The Scab 295
The Tick 296

PAGES

Sheep Lice 296
Maggots 296
Aphtha 297
Wool Pulling 297
Cotted Wool 298
Administration of Medicines 298

ILLUSTRATIONS

FIG.		FACING PAGE
1.	Rack for Feeding Silage	16
2.	Rack for Feeding Hay or Silage	16
3.	Same, Closed	16
4.	Rack for Feeding Hay and Grain	16
5.	Same, End View	17
6.	Box Rack for Feeding Hay	17
7.	Trough for Feeding Grain Only	17
8.	A Reversible Grain Trough	17
9.	Barrel Watering-trough	17
10.	An "A" Type Merino Ram, Plate I	43
11.	Prize Ewe of "A" Type, Plate I	43
12.	Prize Rambouillet Ewe, Plate II	50
13.	Cotswold Ewe, Plate II	50
14.	Flock of "C" Delaine Ewes, Plate III	58
15.	Group of Cotswold Rams, Plate III	58
16.	Winning Lincoln Ewe, Plate IV	63
17.	Southdown Ram, Plate IV	63
18.	Prize Southdown Wether, Plate V	70
19.	Prize Lincoln Ram, Plate V	70
20.	Southdown Ewe Flock, Plate VI	75
21.	Good Type of Shropshire, Plate VII	79
22.	Champion American-bred Shropshire Ewe, Plate VII	79
23.	Premium-winning Shropshires, Plate VIII	86
24.	Cheviot Ram and Ewe, Plate IX	105
25.	Prize Hampshire Flock, Plate IX	105
26.	Champion Oxford Ram, Plate X	115
27.	Champion Oxford Ewe, Plate X	115
28.	Dorset Ram	131
29.	Feeling Fullness of Neck, Plate XI	135
30.	Estimating Depth of Chest, Plate XI	135

FIG. FACING PAGE
31. Determining the Girth, Plate XII 139
32. Determining Levelness of Back, Plate XII . . . 139
33. Taking Width of Loin, Plate XIII 143
34. Width of Body, Plate XIII 143
35. Leg of Mutton, Plate XIV 150
36. Manner of Testing Quality of Wool, Plate XIV . . 150
37, 38. Shearing the Sheep, Plate XV 209
39, 40. Shearing the Sheep, Plate XVI 211
41, 42. Shearing the Sheep, Plate XVII 212
43, 44. Shearing the Sheep, Plate XVIII 217
45, 46. Shearing the Sheep, Plate XIX 219
47. Shearing the Sheep, Plate XX 221
48. Well-tied Fleece, Plate XX 221
49. Rack on which to hang Lambs for Butchering . . 236
50. Killing, Plate XXI 237
51. Carcasses hung to Cool, Plate XXI 237
52, 53. Carding the Fleece, Plate XXII 273
54. Leveling the Fleece, Plate XXIII 276
55. Trimming Sides of Fleece, Plate XXIII 276

SHEEP-FARMING IN NORTH AMERICA

SHEEP–FARMING

CHAPTER I

POSITION OF SHEEP IN PROFITABLE FARMING

The sheep occupies a unique place among domestic animals. It appears to have been the first to have been bred in captivity, and there is hardly a part of the world where it has not been reared extensively. Although of such great age and so widely known, its management is less understood by landowners in general than is the management of cattle, horses, or swine. This is because it has not been generally considered as adapted to the utilization of rich arable lands in sections in which intensified farming has to be practiced. English farmers furnish an exception to this statement. There are many matters of recent development that make it appear that the possibilities of sheep-raising are to be appraised more highly in the future by American farmers.

Natural conditions for sheep. — In the natural state, sheep inhabit only the high altitudes, and the growth of wool is necessary to protect them from the low

temperatures of such regions. They naturally cover a large range of country in procuring their food and feed on a wide variety of plants. Under usual range conditions, sheep are not greatly removed from such natural environments. The herders keep the flocks banded sufficiently close to prevent the ravages of predatory animals of the lower altitudes. The scope of country covered by bands of range sheep is as wide as and no less varied than under wholly natural conditions, and when the drives are not long and the forage not depleted by overstocking or unfavorable seasons, the flocks in no way suffer from the semidomestic conditions.

Sheep-ranching, variously modified, is the system of sheep husbandry that prevailed in ancient historic Asia, later in Spain, and to-day in western American states. Much of the area used for ranching is unsuitable for farming and can be made to yield a revenue only when given to grazing. Sheep have proved to be more profitable grazers than cattle in some instances, as a part of the lands grazed by sheep are too scant of water and too rough to be utilized by cattle. The most of the world's wool supply is produced under such conditions as referred to in North and South America and in Australia. The low value of these wool-producing lands makes sheep-raising unprofitable on valuable fertile land so long as sheep are regarded and kept chiefly as wool producers, because the in-

vestment is so much smaller in the case of the range. Large areas in different countries seem destined to be always utilized for grazing chiefly by the types of sheep bred primarily for wool-production.

Combining wool and mutton.—It is as meat-producers that sheep command the study of men who seek fully to utilize farming lands. This does not mean that wool is to be wholly disregarded in rearing of meat-producing sheep. A very useful degree of efficiency in wool-production is entirely compatible with even the maximum efficiency in producing meat. Placing entire dependence upon revenues from the wool of sheep maintained on farming lands, can be remunerative only so long as wool is protected from having to sell in markets open to the product of the strictly grazing areas. Because of the wool tariff, the sheep industry in America in the past has experienced many fluctuations that have served to prevent continuous advance toward such a generally settled policy as supports the horse-, cattle-, or swine-raising industries.

Lands for sheep.—It is not the purpose of the next few pages to argue the desirability of keeping sheep on every farm, but rather to discuss their peculiarities and the features in which they differ from other stock so that their usefulness may be estimated fairly. No discussion as to the advantages of stock-farming over grain-farming is in place. The problem of soil fertility allows practically all farm

owners a choice only as to how much or what kind of stock shall be kept. Various factors determine whether one farm or one locality should be devoted mainly to the keeping of one special class of live-stock or to giving equal place to each of two or three classes.

Farms or localities of so rough or hilly nature as to have to be used mainly for grazing can undoubtedly be best used for special sheep-farming. Such country affords the sheep the closest approach to its natural life and offers less to contend with than is found under less natural surroundings. Many steep hillsides now being cultivated in some states would yield much larger net returns if kept in good grass and grazed by well-bred and carefully tended sheep. Small non-productive parts of farms can be utilized during some months for the maintenance of flocks that at other times may be used to utilize the waste and part or all of the crops produced on the remaining acres. This does not apply to land that is non-productive because of being wet, although some breeds have been produced that are specially adapted to low lands.

Sheep for intensive farming. — Because of being peculiarly useful in utilizing waste lands, the value of sheep for answering the same purposes as do cattle and swine has not usually been realized. The intensive farming practiced on highly valued English lands gives sheep-raising almost as important a

place as it gives to the keeping of cattle. The economic advantage of sheep as compared with cattle lies in the fact that they produce more liberally in proportion to what they consume. Though smaller in size, they consume more feed in proportion to their weight, and because of this a larger proportion of what is eaten goes into increase. It is a general principle among animals that the less the size, the more rapid is the rate and the greater the economy of maturing. It is only when conditions allow such liberal feeding as is necessary to rapid and economical development that the possibilities of sheep husbandry are realized. Whether or not this advantage is offset by other conditions will depend upon the cropping system. Although they are ruminants, sheep are not as well fitted as cattle to utilize large quantities of coarse roughage. This fact probably puts sheep at some disadvantage in comparison with cattle as the main stock on farms in the corn belt, although other features still give them an important place on such farms.

In restoring or maintaining fertility, considerable use must be made of green crops. The grazing off of such crops by sheep involves little extra labor and leaves the main part of the fertilizing elements where needed. The form in which the sheep manure is dropped and the way it is tramped into the soil insure a smaller waste than is possible under any other system. The compacting of the soil by the

small hoof is also helpful to many loose soils. The sheep's habit of lying upon the highest part of the field or pasture leaves the larger part of the droppings at the place they are most needed. Rape grown in cornfields can be satisfactorily utilized only by sheep. The fact that sheep can be most satisfactorily used to feed off green crops is of importance in the solution of the farm labor problem. There is a saving of the cost of harvesting the crop and of feeding it out again, and nothing is sacrificed in the returns secured from the land so utilized. A flock that is kept in this way and that is large enough to feed off the forage that can be raised on a considerable part of a farm requires a good deal of attention. Competent shepherds are not plentiful, but competent hands that have the true stockman's instincts can learn the shepherd's art. Though continuous, the labor is varied and much lighter and more attractive than ordinary field labor.

Peculiar advantages in sheep-farming. — There are other points to be weighed in deciding the place to be given to sheep in any plan of stock-farming. Not only may they be used to utilize otherwise waste land, but they convert into mutton or wool much material that cannot be utilized by other animals. Particularly is this true of lost grain left in stubble. Volunteer growth or aftermath too scanty to afford pasturage for other stock is just suited to the roving habits of the sheep. Moreover, their manner of

grazing makes them highly efficient in keeping weeds in check. Of the numerous plants regarded as weeds, cattle and horses eat about fifty per cent. The proportion not eaten by sheep is less than ten per cent. A single sheep does not destroy a whole plant at one time, but moving as they graze, each sheep in passing nibbles a few leaves, and when the flock has passed, the plant is defoliated. Weedy cattle pastures into which sheep have been turned have been found to carry the sheep and an added number of cattle after the weeds were destroyed and the grass given fair chance for growth. Cut-over timber lands on which the growth is not too rank may be cleaned up almost as effectually as can be done by goats, although to do so it is necessary to confine sheep rather closely to such areas. In their usefulness in keeping weeds in check, they do a service that must otherwise be performed by paid labor, and they do it effectually and at times when farm hands often cannot be put at such work.

Other features of sheep-raising are of interest in a business way. The revenue from wool and that from the lambs and mutton come in in different parts of the year. While in a general way values of mutton and lamb accord with the wool market, it seldom happens that both products have to sell at bottom prices at the same time, and the wool clip is easily stored with practically no waste or deterioration if it is desirable to hold for a higher price.

The returns come quickly. Lambs may be marketed eight months after the ewes are bred, and when, as is often the case, the ewe's fleece pays for her keep, the lambs sold have no charge against the mother other than the feed they consume and the labor involved. Considering that in a flock bred with attention to both wool and mutton, the increase may safely be counted at one hundred per cent, the possibilities of sheep husbandry are scarcely less engrossing than those which amateur poultry raisers are wont to compute.

These advantages and possibilities make the keeping of sheep very attractive. They cannot be realized if the interest or attention is half-hearted or irregular. To insure the rapid maturing of the lambs, a variety of suitable feeds and grazing crops must be provided. Intelligent and studied breeding is necessary to maintain a profitable combination of wool- and mutton-producing qualities. To realize the attractive possibilities, each animal must have the most favorable opportunity to grow and develop and must always be healthy. Keeping a flock free from the diseases and ailments that deplete the numbers and impair the thrift demands care and foresight. Sheep kept on ordinary-sized farms and brought to maturity at a rapid rate are under conditions that afford a striking contrast to the freedom and scope of their mountain homes in a state of nature, and the effort to maintain and utilize

what has been attained in a great many generations of improvement must be intelligent effort. Prevention of troubles is much more satisfactory than the treating of them after they appear. Intelligent shepherding adds greatly to the pleasure and profit to be derived from farming either low- or high-priced lands.

CHAPTER II

SHEEP FARMS AND THEIR EQUIPMENTS

The sheep is preëminently the animal for grazing lands. From this fact, it is supposed by many that the sheep belongs to a frontier country and to rough sections not available for cultivation. The sheep always has gone with the advance guard of civilization, and, because during the past century there has been so much new territory occupied by civilized man, the world's demand for sheep products has been very largely met from the cheap, newly occupied lands of both North and South America and Australia. During the last quarter of the nineteenth century, sheep products, especially wool, were so low in the world's markets that the sheep was hardly a competitor in profits on tillable lands, in densely populated regions, with other lines of farming. A generation has grown up in the belief that the sheep has no place on the corn and hog or dairy farm.

After visiting nearly all parts of the United States and Canada where sheep are kept, the writer is confirmed in the opinion that the unequal competition eastern farmers have had to meet from cheap western lands is just about over. The rapid settlement of

the Rocky Mountain and Plains regions has pushed the price of land to a level with that of the East, or as near it, certainly, as its productive value warrants. There is no longer a West in the sense in which Horace Greeley used it in his famous advice, "Go West, young man, go West."

World conditions as regards the sheep industry now promise as much profit from the keeping of sheep on the farms in the corn belt as from the keeping of hogs or beef cattle, if not even dairy cattle. Upon practically every farm that is fenced with woven wire, a small flock could be kept with a large per cent of profit. Small flocks remain healthy and live largely upon herbage rejected by other classes of stock. And small flocks on the same pasture with other stock, even cattle, are no detriment to them, as many farmers suppose.

The reputation Canada has made as a sheep country has been due to its small flocks — ten to twenty on almost every farm. Very rarely indeed are as many as forty breeding ewes found on one farm.

American farmers' inclination to vacillate and go to extremes has been greatly to their disadvantage. At times they have scrambled over each other to buy sheep, often getting more than they were prepared to keep well, and again as frantically trying to dispose of all.

Another notion that has militated against the stability of the sheep industry is that it will not do

to keep one strain of sheep on a farm many years. While it is true that sheep should be changed from one pasture to another frequently, there is no reason why the same strain of sheep should not be kept upon a farm continuously. The writer's family has kept sheep continuously upon the same farm for fifty years. A small flock of sheep may easily be kept healthy on the same farm indefinitely. Still another reason why sheep are in disfavor with many farmers is that they still think of sheep solely as wool-producing animals and handle them in a way that does not make the mutton product a prominent factor.

The sheep, except under range conditions, should be thought of primarily as a meat-producing animal and handled in such a way as to make mutton lambs the chief source of income. When this is done, sheep will be found profitable on all our general farming lands. And upon all hilly lands where blue grass or other good pasture can be made to grow, sheep should be the dominant interest. There is no other line of farming under which the land may be allowed to go to grass so completely as with sheep-farming. Any farm that is well enough drained, either naturally or otherwise, for successful tillage is suitable for sheep, though limestone clays and gravels are most favorable. Sheep to thrive must have dry footing, and they prefer the grass that grows upon well-drained land.

Shade is a great comfort in mid-summer but not

absolutely necessary, and running water is a convenience at certain seasons. Artificial supplies are now so easily provided for the short season in which there is not a natural supply available that springs or perpetual streams are not a limiting factor for the would-be flock master.

Number of sheep to farm. — Not in many instances will it be advisable to stock a farm to its limit with sheep. Under that condition, the parasitic enemies are almost certain to multiply to a damaging extent. Nor is there any particular economy in making a specialty of sheep. They call for no special, expensive equipment, nor can the labor expense per head be greatly reduced by keeping large flocks under farm conditions. The smaller the flock, even down to one, the better sheep do. Perhaps one mature sheep per acre of farm should be taken as about the limit, in connection with the horses, cows, pigs, and poultry desired on the average American farm. But I should not advise many to keep sheep to this extent. The small flocks will be found to give the larger per capita return. Perhaps a land investment of fifteen dollars to furnish pasture for each mature sheep is a safe basis for estimating that part of the equipment.

Buildings. — The buildings for sheep need not be expensive. Warmth is not important, except for lambs yeaned in the winter. The desirable features in a stable for sheep are that it should shelter them from rains, be dry underfoot, admit the sunlight

generously, and afford good ventilation. Indeed, in the latitude of the Ohio valley and farther south, many flocks run in the fields throughout the year. The writer believes, however, that north of the Ohio River, winter shelter should be provided, and that when the weather has become severe the flock should go into the stable and remain there throughout the winter. It is the unsheltered feed-lot in latitudes of winter rains that are a source of aggravation to the sheep feeder; then they are such a channel of loss of plant food as not to be tolerated. When sheep are turned out of the barn, it is better that they should go at once to the field, preferably a good blue grass sod. This applies to regions of winter rains. Farther north, where snows prevail throughout the winter, the open feed-lot is in favor. For many years, the writer has practiced putting his flocks in barns at the approach of winter and not turning them out again until the grass has made a good growth in the spring. This is with ewes that yean in the fall or early winter. Ewes of the smaller breeds should have at least ten square feet of floor space per head, better more, and the larger breeds fifteen. With abundant provision for ventilation, this is sufficient. The windows should be hinged at the bottom and have casing so made that they may swing in at the top. The doors should be made in upper and lower sections so that the upper can be kept open except when it is necessary to close it against storms. Mature

sheep need no protection against cold if kept dry and sheltered from wind. There should be at least two square feet of glass windows, through which the sun can shine at some time upon the floor, for each one hundred square feet of floor space, and twice that amount would be better. It is dark, damp, and poorly ventilated stables that are responsible for the somewhat widely prevalent notion that sheep will not thrive in confinement.

At present prices of material and labor, new barns for sheltering sheep and their winter feed may be built for about $300 for each hundred sheep — the larger the barn, the less cost per cubic yard of space inclosed, up to a certain limit in height and width. Forty feet is an economical width and any desired multiple of 14 in length. When greater width is desired, the economical way to provide it is to attach lean-to sheds 14 to 16 feet in width. The plank, truss frame is the most economical in both lumber and labor. With the advent of silage as a sheep feed, less storage room for hay is needed. For fattening sheep and young stock, low sheds open to the east or southeast are very satisfactory, though they call for storage room for feed elsewhere. Should silage prove satisfactory as exclusive roughage, then the silo and a low, open shed would be a satisfactory combination of storage and shelter. The writer has used silage extensively, but has not used it as an exclusive roughage.

Racks and troughs. — When silage is used, the rack described in Figure 1 is very satisfactory. A cheaper and lighter rack for both grain and hay is shown in Figure 2. It may be used for feeding silage also. It is 2 feet in width, inside measurement, and may be any convenient length. The posts are 30 or 32 inches high, depending upon size of sheep to be fed. The floor of the trough should be elevated 8 to 10 inches above the foot of the post. The side boards are 6 inches wide. When made for feeding small sheep, the perpendicular slats should be 12 inches from center to center. They are made of $\frac{1}{2}$- by 2-inch stuff, thus leaving a 10-inch feeding space between. For larger sheep, more room at the rack must be provided. This can be done by putting the upright slats wider apart. The feeding spaces are closed, while feed is being distributed by a panel of 2-inch slats, spaced the same distance, that is arranged to slide half the width of the feeding space, as shown in Figure 3.

For feeding hay and dry grain, the rack shown in Figure 4 is highly satisfactory. With this rack empty, grain may be poured into both troughs at the same time, as the slats sloping toward either trough are equal in number and width. Two inches is the proper width to make the slats. The figure will make the construction clear.

The simplest provision for feeding hay and grain is to do so in separate racks. For the hay, a simple box rack shown in Figure 6, and for grain, the

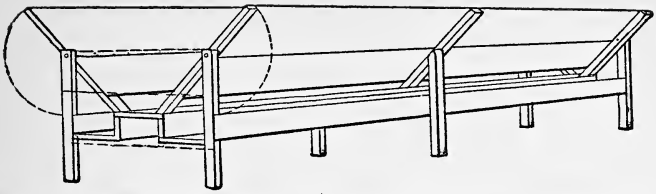


FIG. 1. — Rack for feeding silage ; the sides swing down to shut sheep out and while cleaning out or putting in feed.

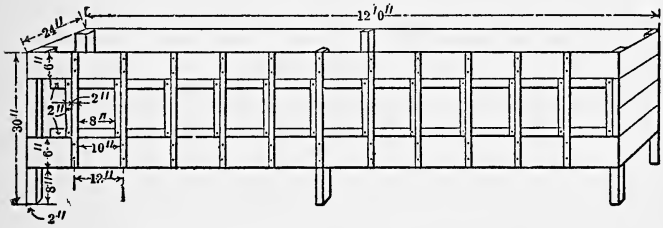


FIG. 2. — Rack for feeding hay or silage.

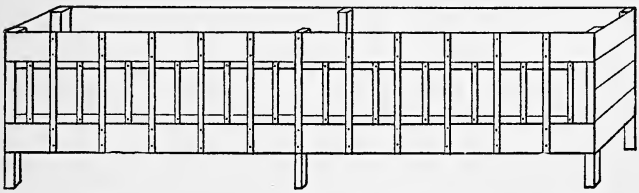


FIG. 3. — Same rack as shown in Figure 2, closed for putting in feed.

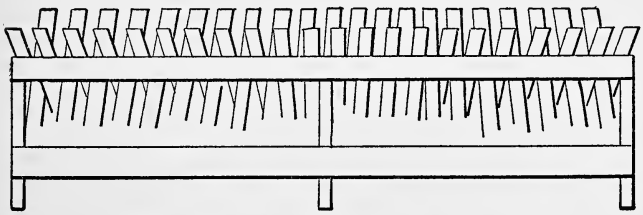


FIG. 4. — Rack for feeding hay and grain.

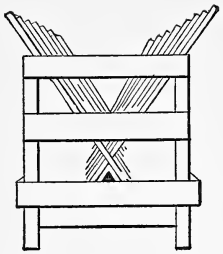


FIG. 5. — End view of rack shown in Figure 4.

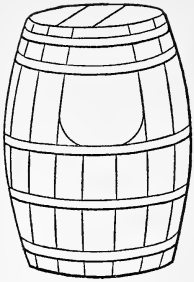


FIG. 9. — A watering trough made from an ordinary barrel.

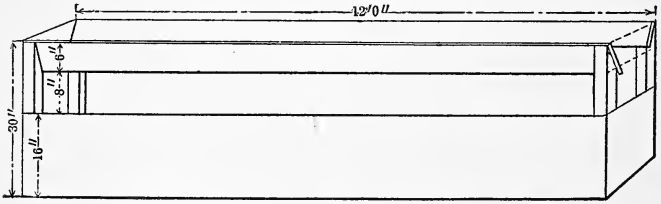


FIG. 6. — Box rack for feeding hay.

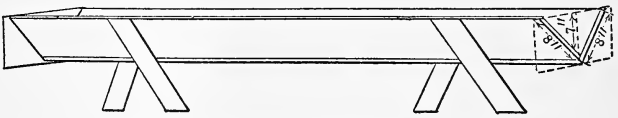


FIG. 7. — Trough for grain feeding only.

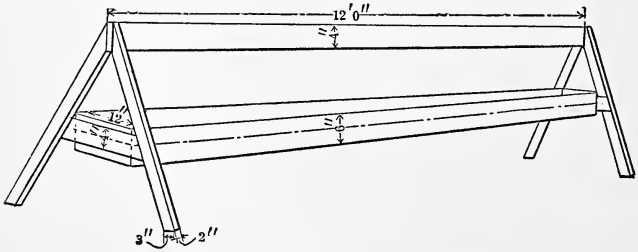


FIG. 8. — A reversible grain trough.

V-shaped trough shown in Figure 7 are satisfactory. The hay rack should be 30 inches high and 30 inches wide. The feeding space should be 8 inches wide and at least 16 inches from the ground. A common error is in making the lower boards too narrow, also the rack too narrow, so that there is too little room for hay below the feeding space, and the sheep are forced to press their heads into the hay, thus getting seed and chaff in their wool, also enabling them to waste much feed. The grain trough is made of one board 7 inches wide and $1\frac{1}{8}$ inches thick, and one 8-inch board $\frac{7}{8}$ inch thick. Any of the cheaper hard woods are suitable for this rack and trough. The trough should have legs that will support the edges 16 to 18 inches above the ground, depending upon the size of the sheep to be fed. The higher it is, the less apt are the sheep to get their feet into it.

A better trough for outdoor feeding is a flat-bottomed, reversible one supported on a truss as shown in Figure 8. The bottom board is 12 inches wide and the side boards 6. The side boards extend equal distances both ways from the bottom board, making a double trough. A bolt through the truss and into the center of either end of the trough supports it and permits its being turned whenever it is desirable to do so. A peg through both truss and trough near the edge holds it in position. A 6-inch board supported in the truss above the trough keeps sheep from jumping into it. This is a very advantageous feature.

Watering-troughs. — Watering-troughs should be so arranged that the sheep cannot befoul the water, and so that hay or other feed cannot easily fall into them. When large numbers are to be provided for, a large storage tank, provided with float and cut-off, should be arranged to hold a supply of water at the right height for the sheep to drink. This should be connected by underground pipes with smaller troughs conveniently located. Small barrels with a hole in the side large enough for a sheep to enter its head are highly satisfactory. Figure 9 shows one. They should be placed on end and the upper head removed and made into a lid. This permits easy cleaning when it becomes necessary. When such a water system is not considered available, tubs that may be easily emptied and cleaned should be used. A 50-gallon barrel cut in two makes convenient tubs. They should be partially covered with removable lids. Sheep are very dainty as to odors, so that drinking-vessels must be kept scrupulously clean.

A convenient source of water supply is the rain-water from the stable roof. When elevated land near the barn permits of a cistern above the level of the sheep stable floor, it should be availed of. Up-ground cisterns are now made of concrete. The writer has had a galvanized tank on upper floor of barn that is still in use after sixteen years. Well water is equally suitable for sheep.

Fencing. — Woven wire is altogether the most con-

venient and economical for either permanent or temporary fences. Twenty-eight to 30 inches is high enough for sheep. For temporary fences, use the lighter and softer wire because easier to move. The writer, after years of experience, thinks that both line and stay wires in permanent fences should be No. 9 or larger. The posts may well be 3 rods apart on level ground.

CHAPTER III

BREEDS OF SHEEP

The breeds of sheep are commonly divided into three classes on the basis of the character of the wool. These classes are the fine, medium, and long wool. The Merino breed includes all the fine wools, and the medium and long wools are sometimes referred to collectively as coarse wools, which they are by comparison with the Merino types. The Merino has been bred in nearly all parts of the world, and many breeders have given special features to their flocks that might entitle them to a special name, but they have all continued to be called Merinos, though at times with words prefixed to designate their peculiar characteristics. Improved sheep, other than fine wools, include at least twenty-five distinct breeds. These represent separate successful endeavors to produce an animal of special size, form, or such peculiarities in manner of growth and feeding as adapt them to the special needs of the localities in which they have been developed. The need of these special adaptabilities is much more pronounced when meat production is considered than when the aim is chiefly to produce a high quality of wool. The production

of wool has been carried on mainly in parts of countries where the conditions of raising sheep and the marketing facilities were such as to center attention chiefly upon the fleece. Consequently, the fine-wool sheep, though raised in widely separated countries, are represented by fewer varieties or breeds than the coarser wools or sheep in which mutton is a more important consideration.

Habits of sheep. — The habits of the domesticated sheep are as a rule traceable to similar traits in the wild sheep. Perhaps the strongest instinct in both is to seek the highest altitudes. From the time that the lamb first supports itself on its awkward and unsteady legs, its constant desire seems to be to attain the higher eminences. When allowed egress from their pens, the lambs are likely to congregate on the highest knoll in the field, and contest supremacy for the highest point. If a barrel is set in their pens and boards arranged so as to run from it to the ground, it affords the lambs evident enjoyment to run up the board to the top of the barrel. The aged sheep retain this trait of their lambhood. In the evening when the flock is seeking a spot to fold for the night, they are certain to choose the highest and driest portion of their pasture field.

Another instinct invariably asserting itself is that of following the leader. This, at times, is a source of annoyance and anxiety to the shepherd, for no matter where one sheep may go, the others are sure to at

least attempt to go, also. This instinct the shepherd very often uses to advantage in driving sheep, for if one is induced to go, the others will gladly follow. It does not seem that any individual is chosen leader, though one may be observed to lead frequently, but as a rule they all seem to rush to follow as soon as one volunteers to lead. Curiosity is a striking feature of their nature. A bit of white paper blown past them by the wind will cause them to start towards it. Anything moving that they do not understand holds them entranced. A trait common to sheep is to stamp the foot when alarmed or excited. It seems to be a signal that readily alarms the rest of the sheep, and it is also one that the ewe employs freely if a stranger approaches when she has the care of her lambs.

The domesticated sheep has never been known to return to a wild state, no matter how much neglected. They will always return to the fold where they reared their lambs, if not put in other quarters. Though they become timid of strangers, yet they give every confidence to their caretaker if he proves himself worthy of it. It is a curious fact that a flock of sheep in ascending a hill will not ascend it straight, but always follow a diagonal course. Another peculiarity is that it is almost impossible to induce them to take a step backwards. They will never back unless frightened, or a greater force than theirs compels them to do so.

In respect to their habits in eating, there is nothing noteworthy, further than that they eat the turf closer than other domestic animals. They are enabled to do this through the agency of a split lip. The upper lip being somewhat divided and the incisor teeth being very sharp and chisel-like, they can graze very close. Another feature that is oftentimes used to their disadvantage is the extent to which they can exist without water. This seems to be accountable to the fact that some of the salivary glands are unusually large in sheep. Bearing on their conduct toward water, it is often interesting to observe their marked preference for running water. When watering them at the pump, they will crowd for positions at the smaller trough with its running stream in preference to the large with its greater abundance of water.

Ancestry of present-day sheep. — The story of the origin and development of the existing breeds is of great interest in itself aside from its value as a study of methods of improvement and of the proper place of each. All varieties of domestic sheep have been classed together as *Ovis aries*, the species *aries* being considered as represented alone by the domestic form. While there can be no doubt that all our breeds, fine and coarse wools alike, are of a common stock, it seems strange that no representation of the species should be found in the wild state. It is more than probable that the early stock to which our

modern sheep trace was an amalgamation of a number of domesticated wild types. At a very early date, men maintained flocks and in some measure directed their development by controlling the matings. The time that has elapsed since the first recorded accounts of sheep husbandry is sufficient to allow for the widest departures from the original types.

The successful management of sheep is based very largely upon the significance of the fact that they are by nature the inhabitants of only mountainous areas. Their habitat is above that of other animals and allows them a freedom of range with a wide variety of plants to feed upon. The high altitudes to which they are native insure dryness and freedom from the numerous forms of parasites that abound in damper soils, especially on those that are heavily stocked. Even with the breeds that have been developed for conditions that are the opposite of those of the wild sheep, there is need of continued care and watchfulness to offset the effects of the unnatural environment.

American sheep trace wholly to importations from Europe, and that the stock of that continent had its rise in Asia, there can be little doubt. The immense mountain ranges of Central Asia seem to have been the habitat of the sheep in its natural state. Many of the Asiatic sheep are either short-tailed as is the goat, fat-rumped, or else have long fat tails the weight

of which at times is equal to one third that of the body. This class of sheep seems to have found but little place either in Europe or America. Only a few of the native Asiatic type have the form of tail possessed by modern sheep, and this fact as well as the history of the movements of the earlier peoples connects the stock of modern times with that of the early Jews and Syrians.

Most, though not all, wild types of sheep have a growth of wool that is softer and finer than the outer and longer hairy covering. The development of the wool and elimination of the hair under the direction of the early peoples was such as to give great value to the fleece, which was then the main object of sheep-raising.

Early sheep-breeding in Europe. — From the eastern lands the Romans brought sheep of fine-wool-bearing qualities. They advanced the art of wool-growing for a time, but their work was not continued, and its influence persisted only through such of their stock as was transferred to Spain. Up to the middle of the fifth century, the Spanish flocks also received modifications through the stock of the Carthaginians and the Moors. Much of the Merino's oil-bearing quality seems to have had its source in the blood of the sheep of Northern Africa introduced into Spain by the Moors at the time of their occupation of that country in the eighth and ninth centuries. This fact and the favorable influence of the climate and

vegetation appear to have aided the Spaniards in achieving their great success in breeding for wool.

During the period of the domination of the Moors, European civilization reached its highest point in Spain. Agriculture and manufacturing were especially advanced. The city of Seville was the home of the greatest weaving industry of the time, and no less because of manufacturing skill than because of the quality of Spanish wools that were unequaled elsewhere. Although manufacturing declined with the conquest of the Moors, the country continued to furnish the finest quality of wool for export. A part of the flocks was maintained continuously on the farms of the central areas, where summer drouths are less severe. A larger proportion was driven to the northern part of the country for summer pasture, much as western ranchmen of to-day move their herds over long distances to secure summer pasturage in the mountain regions. There was a third type of Spanish sheep that was not bred for wool as were the Merinos, but it has had no influence abroad.

Spain maintained her supremacy in wool-production until the nineteenth century. Not until nearly 1800 were sheep taken from Spain to establish the industry in other countries. In 1788 and 1796, the French government made large importations of Spanish sheep, and a royal flock has since been maintained at Rambouillet near Paris. The outcome of

this enterprise was the Rambouillet breed, which is discussed in later pages.

In 1765, the Elector of the German state of Saxony secured a number of Spanish rams and ewes. These responded to the careful management of their owners, and so skillfully was the breeding continued that the fame and influence of the Saxony Merinos in foreign countries has been second only to that of the Spanish sheep.

Sheep-breeding in Great Britain has always been based primarily upon the production of mutton, and the separate discussions of the origin and peculiarities of the various British breeds make up the next chapter.

Formation of breeds. — In the course of development of the countries previously referred to, the sheep, being almost coeval with man, has been subjected to the action of a numberless variety of natural influences that have given rise to divergent types and qualities. It has been a constant study with those realizing the need of new adaptations for different localities to produce and fix such variations in types and qualities as might be found profitable. The conditions of soil, climate, and herbage, all controlled in a large degree by altitude, had an influential effect in earlier days, while during recent years, perhaps the most potent powers working changes in the qualities of sheep have been the care and management of the breeder in his methods of

feeding and breeding. These are clearly to be seen in tracing the origin of the breeds.

Classification of breeds. — Several classifications of breeds have been made and they are all more or less elastic. The color of the face, dividing the breeds into the dark-faced and the white-faced, has been used as a dividing line; the quality of the fleece, whether fine, medium, or coarse, has also served the purpose, and the difference in the length of the wool fiber, whether long or short, has been employed as a basis for separation; but perhaps the best of all classifications, because it is more instructive than any other, is that which divides them according to their adaptability to different altitudes, whether lowland, upland, or mountain.

Classification according to face color. — Separating the breeds on the color of the face, the dark or black-faced group will be found to include all the Down varieties, the Southdown, Shropshire, Hampshire, Oxford, Suffolk, and the Highland Blackface, though the face of the latter is very frequently of broken color. The white-faced group includes all others, though there is a strain of the Cotswold that is dark in the face, and the Wensleydales have faces of various shades of blue.

The wool as a basis for classification. — While the line of division among the breeds based on the fineness of the wool fiber is not marked by a measured limit, yet it is none the less clearly defined. The

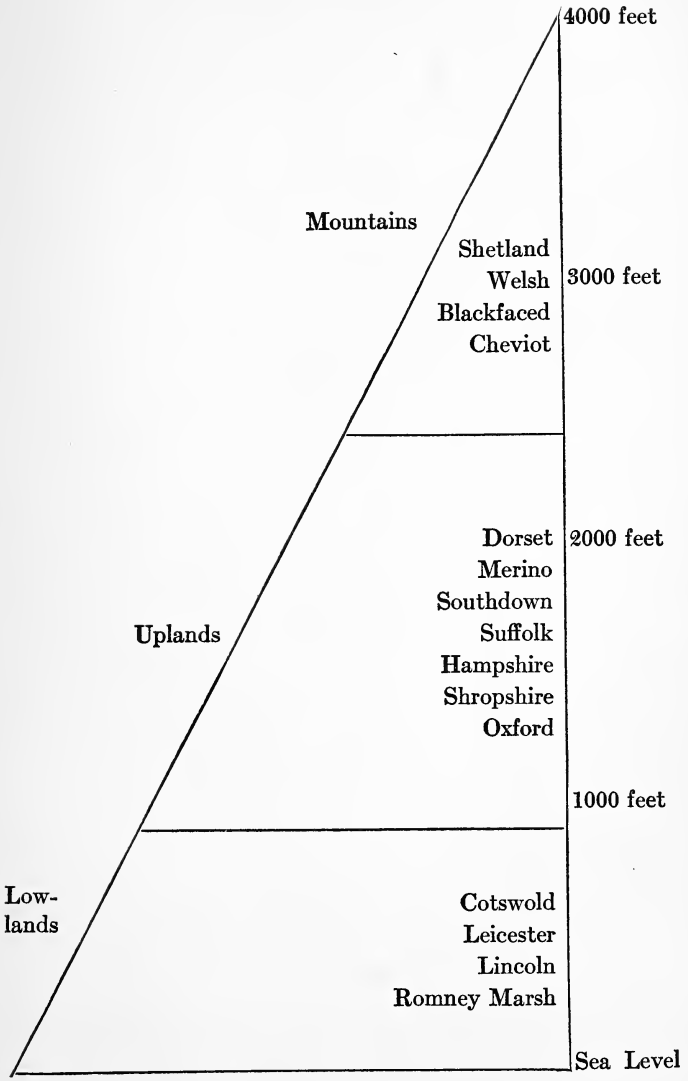
Merino with its multiple families is the only breed that may be properly called fine-wooled, though there are sometimes individuals among the medium wools that would meet the requirements of this term. The medium-wooled breeds may be said to include the Southdown, Shropshire, Cheviot, Dorset, Oxford, Suffolk, and Hampshire; while the coarse-wooled breeds embrace the Wensleydale, Leicester, Cotswold, and Lincoln. The classification based upon the length of the fiber in the fleeces cannot be defined so closely at this time as in earlier days, owing to the fact that the wool of the breeds that were formerly classified as short, has undergone such an increase in length that it cannot be called so now. The long-wooled breeds are identical with the coarse-wooled, while all the others in contradistinction to these may be classified as short-wooled, with the understanding that there is a wide variation in this class.

Classification based on being polled or horned. — Another classification sometimes referred to divides the breeds into polled and horned groups. The polled or hornless heads are the Romney Marsh, Lincoln, Cotswold, Leicester, Oxford, Shropshire, Suffolk, Hampshire, Southdown, and Cheviot; while the horned breeds are the Dorset, Highland, Exmoor, and the Lonks. In the Merino and the Welsh breed, the ewes are hornless and the rams horned.

Classification based on altitude. — It is a common

belief that only a definite kind of land, rolling in character, rocky in nature, and scanty in pasture, is especially adapted for sheep-grazing, but a study of the different breeds and their adaptability for different altitudes verifies the fact that there are breeds of sheep specially suited for most of the variations in natural environment that exist at present. While it cannot be asserted dogmatically that the breeds of sheep are only suited for the conditions of the altitude assigned them, yet it may be claimed that they will do best when their circumstances approach those that they have been accustomed to in their native districts.

Influence of altitude. — The three features requiring consideration in discussing the adaptability of sheep are those of climate, soil, and food. These in turn are decidedly dependent on altitude, and this again, in England and most other countries, is determined by the geological structure that gives the land its shape. The geological strata, whether hard and capable of resisting the elements, or soft and decomposable, exerts an important influence on the altitude or the height above the sea. High altitudes are associated with broken, rocky regions with more exposure than pasturage, whereas the opposite brings to mind the fertile lowlands of alluvial soil and luxuriant vegetation. With the altitude as a basis, it is possible to arrange the breeds so as to illustrate the wide variation that exists in their char-


4000 feet
Mountains
Shetland
Welsh
Blackfaced
Cheviot
3000 feet
Dorset
Merino
Southdown
Suffolk
Hampshire
Shropshire
Oxford
2000 feet
Uplands
1000 feet
Low-
lands
Cotswold
Leicester
Lincoln
Romney Marsh
Sea Level

Color of Face		Fineness of Wool		
Dark	White	Fine	Medium	Coarse
Southdown	Cheviot	Merino	Southdown	Wensleydale
Shropshire	Dorset		Shropshire	Leicester
Hampshire	Leicester		Hampshire	Lincoln
Oxford	Lincoln		Oxford	Highland
Suffolk	Cotswold		Cheviot	
Highland	Merino		Suffolk	
			Dorset	

Length of Fiber		Horns	
Short	Long	Polled	Horned
Merino	Wensleydale	Romney Marsh	Dorset
Shropshire	Leicester	Lincoln	Highland
Hampshire	Lincoln	Cotswold	Exmoor
Oxford	Highland	Leicester	Lank
Cheviot		Oxford	Merino } Ewes
Dorset		Shropshire	Welsh } hornless
Suffolk		Suffolk	
		Hampshire	
		Southdown	
		Cheviot	

Altitude		
Lowlands	Uplands	Mountains
Cotswold	Dorset	Shetland
Leicester	Merino	Welsh
Lincoln	Southdown	Blackfaced
Romney Marsh	Suffolk	Cheviot
	Hampshire	
	Shropshire	
	Oxford	

acter, and at the same time supply a general key to these.

Adaptability of the breeds. — The Romney Marsh, where the sheep of this name are reared, is stated to be a plain of rich soil drained by wide ditches and also so near the level of the sea as to require the protection of walls. Notwithstanding this, there are more sheep kept there than on any equal area in Great Britain. From this, the first rise brings us to the Cotswold Hills with an altitude of 500 to 600 feet; it is asserted that it is only upon hills not exceeding 900 feet in height above the level of the sea that the Cotswold sheep will flourish. Above this comes the Downs, usually rolling in aspect and with an elevation of about 1000 feet above the level of the sea. Higher still, between England and Scotland, are the Cheviot Hills that rise in places 2700 feet above the sea, giving their name to an active hardy breed of sheep that prefer to range such rugged lands. Above this is the home of the Blackfaced mountain sheep, a breed exceptionally rugged in constitution with the ability to do well in a heather country. Again up, and we reach the home of the Welsh and Wicklow mountain sheep that have been observed feeding at an altitude of 3200 feet on the side of Ben Nevis. The highest grazings that sheep of any variety have been known to reach is reported to be in Pem on the plateau of the Andes, that range in altitude from 10,000 to 17,000 feet;

there the temperature does not vary and the fleece of the sheep grows constantly.

Marshall gives an apt illustration to show the natural inclination of the sheep when they are left to themselves in making their choice. He tells of an instance when Lincolns and Downs were kept on a farm that included lowlands and uplands. When the sheep were turned out, the Downs would go to the dry uplands, while the Lincolns would seek the marshy bottom land.

There are probably some anomalies in the classification submitted, but the only one necessary to notice is in respect to the Merino. The Merino is beyond question the most cosmopolitan of the sheep tribe. No breed has passed into all countries and thriven as the Merino, and still further no other breeds have been able to become so closely identified with their environment as to become the progenitors of native families as in the instance of the Merino. This would seem to be due to the migrating habits that characterize the Merino in Spain, where the flocks are driven towards the north in summer and southwards in winter, thus becoming inured to all the variations of a diversified country. In the classification given, the Merino is confined to a prescribed area which is hardly in conformance with the facts. Another feature that is modifying the application of this classification according to the altitude is the degree to which systems of management are changing

in the native districts of the breeds. A greater abundance of food, better shelter, and other details of management will in time obliterate the characteristics of a mountain breed and develop in them the attributes of an upland breed or change the latter into a breed adapted for the lower lands.

Effect of altitude on type. — Type being one of the most peculiar features of a breed, it is interesting to indicate its bearing on the sheep adapted for different altitudes. It may be said that each breed has its peculiar type and within them are the family types that are somewhat characteristic of the flocks of each breeder. It is to the former, when not due to culture, that the references herein are made. In nature, it is produced by function under the untrammeled action of natural conditions. Among the mountain sheep, there is a tendency to approach the shape of a wedge, with an extra strong loin and long hindquarters. Much more defined, however, is the circular form that most of the Down breeds approach, and this is quite distinct from the squarer-formed and heavier bodies of the large white-faced breeds.

Effect of altitude on size. — Closely connected with type is the influence of altitude and its attributes on size. The gamut runs from the Lincoln, the mastodon among sheep, to the smallest of mountain sheep that prefer to have its "ribs less rich" that it may battle successfully with the stern conditions of its native

land. The Lincoln and the Leicester would not long retain their mammoth proportions without the infusion of fresh blood, if forced to graze the rugged sides of the Great Cheviot, which rises 2676 feet above the level of the sea, and it is even less likely that the Cheviot would retain its pertness and lightness of step if confined to the level lowlands. While inspecting a flock of Leicesters on a high and hilly farm, the proprietor advanced the information that he found it difficult to maintain the breed type even though fresh infusions were made constantly; and, in conformity with the general opinion in such matters, he had decided that some disease was prevalent among them. His farm was excellent sheep land according to the usual conception.

A counter illustration is afforded from the conduct of the animals on the lowest sheep land of this continent; that is, Prince Edward Island. The handling of the Leicesters there, as judge, convinced the writer that they were the best fleshed and apparently the thriftiest sheep the writer had ever closely scrutinized. And they had been reared on land that current opinion condemns for sheep. However, they were under the conditions that suited the Leicesters, and consequently they were thrifty and maintained the lowland type. The dark-faced breeds, the Downs, though descended from some of the best flocks, had lost their type and thrift under these circumstances. The Cheviots the writer has seen lose their wool

and general thriftiness under conditions adapted for the heavier breeds, and the characteristics that lead to this are identical with those that make them the champion grazers of rough and exposed pastures. Flockmasters situated on highly cultivated pastures, the conditions of lowlands, find that the Southdown ewes become too fleshy and give birth to weak and soft lambs. Thomas Ellman, the noted Southdown breeder, is on record as saying that so great is the effect of climate and soil that the fine flavor of the Southdown mutton may be changed in time to coarse, tallowy meat; and he further adds that not only the flesh, but the wool and every other feature, will become assimilated to those of the different localities.

Climatic influence on wool. — It is an inexhaustible subject to discuss in detail the influence of altitude and its features of climate, soil, and food on wool. Hair is the greater part of the covering of the sheep in a state of nature, and wool is the result of culture and good treatment; hence its susceptibility to influence. Climate is considered to have an influence on density, and the colder the climate, the denser the fleece grows. On the other hand, extreme exposure, especially in conjunction with poverty of soil, is credited with much of the kemp or dead hairs that appear in the fleeces of some sheep. The fact that the sheep of the eastern counties of England have bare heads and those of the mid-

land and west are covered, has been mainly attributed to the differences in climate. The superior purity of the Australian wools, their softness, lightness, and lustre are attributed to the climatic conditions of that country. It is accounted that small hairy sheep were sent from Bengal to Botany Bay to supply the penal settlement of convicts with mutton and wool in 1788. These, though not by any means a thrifty race, improved to such a marked degree as to make it evident that the soil and climate of the country was peculiarly fitted for sheep-farming. Spanish Merinos were introduced, and it soon became noticeable that the wool from the Australian flocks was of a finer quality than that grown upon the sheep fed upon the pastures of Spain. Dr. Bowman considers that an even temperature and a certain amount of moisture are necessary for the retention of lustre, and he cites New Zealand wool as illustrative of this relationship.

Influence of food on wool. — Altitude, climate, soil, and food are closely connected, and the relationship is very apparent when the fleeces of the different breeds are considered in this connection. It will be found that the large lowland breeds produce coarse grades of wool. The variations extend from the Lincoln, with heavy and comparatively coarse fleeces, to the light and exceptionally fine-fibered wool of the Shetland. The latter has been world-famed since 1790 for the wool entering into the composition

of the shawls so delicate in texture as to be easily passed through a finger ring. In figures, the variation may be expressed by saying that the finest-fibered wool is $\frac{1}{5000}$ of an inch in diameter, while the coarse fibers grown on the large lowland breeds may be $\frac{1}{450}$ of an inch in diameter. Abundance of feed makes heavy fleeces that secure their weight mostly in grease or yolk, and to some extent from the length and size of the fiber. The complaint is not infrequent among some breeders that they are not able to maintain the weight of the fleeces of their flocks. A great abundance of food will keep it up, or if that cannot be supplied economically, a smaller sheep would be better for the conditions and more wool would likely be produced per acre.

Effect of soil on wool. — This relationship of soil to altitude is not as close seemingly as exists between the former and the conditions of climate and food. As to the direct influence, it is known that some soils color wools so that they cannot be washed white. Territory wool has a characteristic bluish tinge that detracts greatly from its market value. Scott asserts that the best wool-growing land is generally that on a sandstone foundation, as it gives the wool the quality of being bright and clean, while he considers that volcanic or limestone soils are thought to favor harshness.

A study of the soil, climate, and food supply of the native districts of the breeds, together with a knowl-

edge of the influence of these and their association with altitude, furnishes a guide to the characteristics and merits of the breeds much more reliable than that from any other source, excepting only actual experience with the breed representatives.

Establishment of American sheep-breeding. — The careful breeding of sheep in America dates from the beginning of the nineteenth century. The development of American industries that followed the severing of ties with England produced a new demand for wool.

In some instances, the legislatures of the original states set apart moneys to be given as bonuses to growers of wool and manufacturers of woolen fabrics. Our political representatives abroad interested themselves in making it possible for American farmers to secure the blood of the fine-wool-producing sheep of Spain and thus establish the industry in this country. General David Humphries of Connecticut, our minister at the Court of Spain, sent twenty-one rams and seventy ewes to his home state in 1802. In 1801, Mr. Adams moved to Ohio and founded the wool-growing industry in that state that to-day leads the farm states in wool-production and is looked to the world over for superior breeding stock. In the same year, Robert Livingston, Minister to France, sent to New York State a number of Merinos from the Rambouillet flock. In 1809–1810, William Jarvis of Vermont, United States Consul at Lisbon, Portu-

gal, secured and had shipped to this country about four thousand sheep from the best flocks of Spain. The Spanish sheep were kept in large flocks, and the efforts of their owners towards improvement had given distinction to several types or strains. Sheep-breeding was deeply studied by many of the owners among the Spanish nobility, and various large flocks became well known for their special valuable features. Chief among these were the Paulars. Mr. Jarvis also sent Aquiries, Escunals, Negrettis, and Montarcas. A part of these remained on Mr. Jarvis' Vermont farm and were afterwards intermingled under his direction and further improvement sought by the use of the Saxony Merino after the year 1826. Great interest had been aroused in sheep-breeding, and "it is estimated that from April 1, 1810, to August 3, 1811, there were brought to the United States 19,651 Merino sheep."[1]

The interruption to commerce in general caused by the War of 1812, cut off foreign supplies of wool, and home prices reached fabulous figures, and so great was the popularity of the Merinos that $1000 was commonly paid for individual breeding sheep. This wave brought its own reaction. At an early date, it was established as a policy of the United States that wool-growing and woolen-manufacturing should be fostered and protected from the competition of other countries by the imposing of duties on imported

[1] Plumb, "Types and Breeds of Farm Animals."

material. In more recent times, the wisdom of this national policy has been questioned, and for short periods free importations have been allowed. The removal or threatened removal of protective duties has always had a serious adverse effect upon the wool-producing industry. Its welfare seems to be closely allied with governmental policy; its history is one of great fluctuations, and the end is apparently not yet in sight.

Improvement in America. — While the growing of fine wool was established in the United States by the importations of Spanish and Saxony Merino sheep, the stock of to-day is very properly designated as the American Merino. Mr. Jarvis wrote to the author of "The American Shepherd": "From 1811 to 1826, when I began to cross with the Saxonies, my average weight of wool was 3 pounds 14 ounces to 4 pounds 2 ounces, varying according to the sheep. The weight of the bucks was from $5\frac{1}{4}$ pounds to $6\frac{1}{2}$ pounds in good stock case, all washed on the sheep's backs." Comparing these figures with such as are common to-day, there can be no question that, though originally indebted to the Spanish blood, the sheep of to-day is essentially an American product. The readiness of African and Australian breeders to use American-bred Merinos is further proof of the Americanism of the modern Merino.

It may be a cause of perplexity to some to consider that while we have a score of distinct breeds

Fig. 10. — An "A" type Merino ram: Don Alfonso, 1405, champion at New York State Fair in 1909. Bred by D. K. Bell, Rochester, N.Y. (Page 44.)

Fig. 11. — A prize-winning ewe of "A" type of Merino. Bred by D. K. Bell, Rochester, N.Y. (Page 44.)

Plate I. Merino Sheep.

of sheep in which mutton is the first requisite, our specialized wool sheep are all Merinos. The mutton breeds were developed independently from varying local stocks having peculiarities of size and facial shape and coloring that give them distinctive appearances. The French and the Germans have developed their own ideals of a fine-wool sheep, and a number of Americans have fixed distinctive characters upon their flocks. Probably some of the American types have as much individuality as the Rambouillet, but they all have the same main characteristics, and to the untrained eye are a homogeneous lot, while the same is not true of the more variable British breeds.

The American Merino

The term "American Merino" embraces a larger number of types and strains than have been developed from the descendants of the original stock from Spain. Mr. W. R. Dickinson of Steubenville, Ohio, had a flock descended from the Humphrey importation. His success and that of the subsequent owner of the flock brought the sheep into prominence, and a number of breeders, having stock of this strain, combined and for some time maintained a flock register solely for Dickinson Merinos. These sheep were hornless, smooth-bodied, and produced wool of extra length and fineness.

In the early days of Merino breeding, the Delaine type was recognized, distinguished by its light folds or no folds, fleshier bodies, and some special length of staple. There came to be recognized Standard Delaines, National Delaines, and Improved Delaine Merinos. From Pennsylvania, also, there emanated the Black Top Spanish Merino, having a separate register for a time. In some cases, the registers really represented separate lines of descent more than actual distinctness of type. There were numerous transfers of sheep from one register to another with ensuing confusion and duplication of work and expense. Practical difficulties arose in classifications for showing. At times some of the types that were really quite different were required to show together. At other times separate judging and sets of prizes were furnished to so-called breeds that were too nearly alike to justify such segregation or registration. At the time of the Louisiana Exposition, a plan was evolved for classifying the types of American Merinos, and this plan is one now generally in use at the leading fairs. Some of the superfluous registers have been abandoned and others have combined, until at present the number of societies is limited to three.

Classes of American Merinos. — The plan referred to for classifying American Merinos provides three groups or classes, known as A, B, and C. Class A includes the sheep that represent the extreme in

production of wool. (Figs. 10, 11, Pl. I.) The entire body is covered with folds and wrinkles. The yolk is very abundant. To be properly classed as A type, sheep must also show the greatest density of fleece and fineness of its fibers, though the length is not so great as in the classes having plainer bodies and less fineness.

Class B is to include sheep less heavily folded than in class A. The body is more developed and the weight of fleece in proportion to body weight is less. The staple is of greater length. This type of sheep is a practical one for commercial wool-production. The heavy folds of class A sheep and the difficulty they cause at shearing time put them at a disadvantage from the wool grower's standpoint. It is claimed, however, that such a type must be maintained to afford a means of maintaining fineness, density, and oil, which qualities are difficult to maintain in flocks bred pure to other types.

Class C is the Delaine Merino. (Fig. 14, Pl. III.) The Rambouillet is not included in the A, B, and C classification. Class C sheep retain marked fineness of fiber with considerably greater length than is found in either class A or class B. They are nearly free from folds and rank much higher as mutton producers than either A or B types. While each animal is registered as either of A, B, or C type, there is no hindrance to mingling the types. The class designation is based solely on individuality and does not necessarily imply anything regarding parentage.

French Merinos

The Rambouillet. (Fig. 12, Pl. II.) — Fine-wool sheep have been bred in France since the close of the eighteenth century. It was in 1783 that sheep were brought from Spain to a farm at Rambouillet, near Paris, under the patronage of Louis XVI. The French government still maintains a flock at the same place. Private breeders in France have worked along the lines followed by those in charge of the government flock, and the stock has become widely known as Rambouillet or French Merinos. Later on, this type of sheep was introduced into Germany and a notable improvement effected in the flock of Baron F. Von Homeyer of Rangin, Pomerania. Many of the Rambouillets imported to America since 1882 have been brought from Germany. From 1840 to 1850, several lots were brought to eastern states. The breed was introduced to Ohio in 1851, and in that state and in Michigan has been bred very successfully.

The French and German breeders have aimed to produce a type of sheep that differs markedly from the original Spanish type, and that is also quite distinct from any of the American types. The mutton qualities are more developed in Ramouillet than in any other fine-wool sheep. They are a growthy sheep with large, strong frames, heavy bone, and commonly having considerable length of leg. They

reach large weights, rams sometimes weighing three hundred pounds. It is the size and growthiness and the mutton qualities of this breed that have given them wide popularity in ranching sections. Sheep ranchmen usually prefer stock with the Merino's proclivities to keep together in bands, because this reduces the danger of losing sheep by their becoming separated from the band in charge of the shepherd and falling prey to predatory animals. As would naturally be expected, the improvement of the size and body of the Rambouillet has not permitted the development of fleece found where wool has been the sole object sought for, while there are some sheep in the breed with staple of fair length and exceedingly fine, and the number of flocks with fleshy bodies and long, fine fleece is on the increase.

The Rambouillet is a smooth-bodied sheep as a rule, except for a few folds about the neck, and a wrinkle in the skin on the sides of the tail-head is preferred by some breeders. The rams have large and strong horns, a regular spiral curve being desired. Polled rams occasionally appear, and the ewes are uniformly hornless.

Contrasted with other Merinos, the Rambouillet is the largest and growthiest and has the best mutton conformation, and somewhat coarser wool. In contrast with the mutton breeds, it is easily their superior in weight and quality of fleece, but suffers decidedly by comparison of mutton qualities. While

regarded as a combination sheep, as usually found it is really better developed as a wool-producer than as a producer of mutton. There are no breeders that select more for mutton than for wool, and many base their selections upon fleece to a much greater extent than upon form. Because of this lack of uniformity in the standards of the breeders, the flocks may differ considerably, but the principle of giving equal stress to fleece and form is being more generally accepted.

CHAPTER IV

BRITISH BREEDS OF SHEEP

It was the Northern European stock that gave rise to the mutton breeds and that was segregated into so many breeds, particularly in England. The connection of this stock with the Eastern types cannot be traced nearly so clearly as is possible in the case of the Spanish sheep. As the forests of Northern Europe were cleared, there were maintained flocks of sheep descended from the stock that accompanied the migrations from the East. Such stock did not receive the impress of the African blood that contributed to the Merino. For a great length of time, there was no serious effort toward improvement, and what interest they received seems to have been mainly on account of their flesh-bearing qualities. Though domesticated, their breeding would be mainly along natural lines, and the result was the development of a number of so-called "forest breeds" distinguished from each other by such characteristics as the peculiarities of the various sections effected through natural selection. Though restricted in area, England embraces a wide variety of conditions due to inequalities of altitude and temperature and

to dissimilarities of geological formations, soil, and vegetation.

Occasional and chance importations from other lands impressed incidental features upon some of the native types, and features so received still persist as incidental but distinctive traits of more recent and highly improved breeds. Of this class of characteristics is the black face which, if its origin could be determined, might establish connection with the native black-faced breed of Abyssinia, most known in Persia.

While English agriculture was by no means in a crude form in the middle of the eighteenth century, there was yet to come the wonderful era of improving the usefulness of farm animals inaugurated by Robert Bakewell. Before the time of Bakewell (1726–1795), it is likely that the idea now too common with us, of limiting sheep-farming to the less valuable lands, was more or less prevalent in Europe. He won for the sheep in general and in intensive farming by making the production of mutton their chief end. The sphere of the sheep spread from the rough pasture range to the lower and more fertile fields, until at this time they have adapted themselves to all the physical conditions existing in Great Britain. The breeder, by working in harmony with the environment, has produced and preserved small differences in type and many peculiarities through which each of the resulting breeds has special

Fig. 12. — A prize-winning Rambouillet ewe from the flock of King Brothers, Laramie, Wyo. (Page 46.)

Fig. 13. — Cotswold ewe shown by Cooper and Nephews. (Page 61.)

Plate II. Rambouillet and Cotswold Sheep.

usefulness in some conditions. The success attending the keeping of sheep on any farm will depend in large part upon the adaptability of the stock used to the soil conditions and farming system. These are usually fixed, and a knowledge of the origin and peculiarities of the breeds is necessary in the determining which one is best adapted to any specific conditions.

The Leicester Sheep

The Leicester as a breed dates its origin from the time of Robert Bakewell (1726–1795), and from his flock the Culley brothers selected the material that they made into the Border Leicester, which has now attained the status of a breed.

The old Leicester. — There are no authentic records of the source from which Bakewell secured the foundation for the new Leicester, though the character and qualities of the sheep that he started with are known. A chronicler states that the Leicestershire and adjoining districts "beareth a large boned sheep, of the best shape and deepest staple, chiefly they be pasture sheep, yet is their wool coarser than that of Costal" (Cotswold). Another authority enumerates among the deficiencies of the old Leicester that they were coarse-wooled, large-framed, heavy-boned, with sharp chine, mean rump, loose skin, and that they were seldom ready for the butcher before three years old.

The work of Bakewell. — Before Bakewell's time, the most of the sheep in Great Britain were of the heath or forest class and not adapted to the needs of arable farming. Bakewell began with the large-framed, slow-maturing sheep, and in the course of his life succeeded in making a permanent type, much finer in quality and truer in form, and especially quicker in maturing. There are no reasons for believing that Bakewell drew on any other source for improvement than selection in his own flock. He was a close student of animal form, and it was his practice to observe the relationship of outward form and qualities to the character of the meat and the development of the carcass. From his studies he evolved in his mind the type he desired to develop and perpetuate. This type has been expressed by saying that he desired to secure in the body of the Leicester the shape outlined by a common soda-water bottle. Commenting on this, an authority states that Bakewell always insisted on the necessity of a barrel or egg shape. Ridgy backs and big bellies were his aversion, this authority states, fulfilling as they did his favorite metaphor of a horse's collar put on the wrong side upwards. Against large bone and carcass full of offal, he waged vigorous war, and according to the same author the "hogshead of truly firkin shape with short, light-boned legs, not exceeding six inches in length, was his improved Leicester sheep mould, on the plain principle

that the value lies in the barrel and not in the legs." To make this type, Bakewell relied chiefly on selection, and to maintain it, he pursued a course of in and in breeding. There is no creditable evidence to the effect that he resorted to crossing in forming the type, and there is authority for saying that he was a disciple of in and in breeding. As soon as he had the breed established, a demand began to grow for the sheep, but instead of selling them outright he adopted the plan of letting rams. They were in demand for crossing on common stock. In 1770 he began letting rams, but had difficulty in getting places for them, as may be inferred from the fact that they were let out for the season at 17*s.* 6*d.* per head, but in 1786 he received 300 guineas for the use of one ram, and in 1789 he obtained 6200 guineas from his ram-letting operations. While Bakewell was successful in securing the features he desired in his sheep, there were other qualities that suffered as a consequence. Weakness of constitution resulted from his operations, that made these sheep unable to withstand exposure and hard keep, and they also became more or less subject to inflammatory diseases. They became less prolific, and the ewes proved very poor nurses, owing to the impairment of their milking qualities. Bakewell gave no study to the fleeces of his sheep, hence no improvement occurred in the wool, though in nearly all other features a much higher type of sheep was evolved.

Appearance of Leicester. — In the first volume of the American Leicester Record, the appearance of the Leicester is described as that of a fine-looking animal, white in face, eyes clear and prominent, ears well set and free from blue. Sometimes black spots appear on the ears, but are no disadvantage. Continuing the description, he says: "The neck is well set into the shoulder, full and broad at the base; the shoulder deep and wide; breast full and broad, and no uneven or angular formation where the shoulder joins the neck or back; deep in flank; quarters long and square. The legs are bare, being covered with hair rather than wool, and stand wide apart with no looseness of skin on them, bone fine and hard, legs of moderate length, straight on back and broad, light in belly, nearly as straight below as above (showing light offal) noble bearing, style, and action." It is not intended to offer this as a description of all Leicesters, but it is submitted rather as the ideal type that the breeders are seeking. The Leicester is invariably a strong-backed sheep carrying a thick covering of flesh that is very likely to be soft. The body in shape, compactness, and smoothness is hardly surpassed by any breed of sheep, but in type they are inclined towards legginess, an appearance added to by the lightness of wool on the belly.

Mutton qualities of Leicester. — The most valuable feature associated with the Leicester as a breed is their quick fattening qualities. They fatten readily

and hence attain heavy weight at an early age. The highest rate of gain made by the Leicester at Smithfield was in 1887, when the first prize pen averaged .76 pound daily from birth to time of slaughter which nearly equal the best records that have been made. These figures sustain the claims made for the early maturing qualities of the Leicester. From them it is evident that members of this breed are capable of standing high feeding and return rapid gains, but it leaves the point undecided as to whether or not the gains are profitable. The quality of the meat from the Leicester is not conceded to rank with the best, as the preponderance of fat is a characteristic of the carcass. This adds to the percentage of offal and in return detracts from the value of the carcass.

In the first volume of the American Leicester Record, it is said that the Leicester matures very early and is of good size; the rams weighing 300 pounds and the ewes 200 to 250 pounds, each fine-boned and with very little offal, making a very profitable animal for market as well as for wool.

Characteristics of the Leicester fleece. — The weight of the fleece of the Leicester has been estimated to be 10 to 15 pounds. Twelve pounds would express a fair average. Referring to the fleece, a writer states that the wool is fine in texture, tolerably lengthy and often curly, varying in weight according to the type from about 6 or 7 pounds to 9 or 10 pounds. The wool is at least 8 to 10 inches long and very fine and

lustrous. It is likely the finest-fibered wool of any of the long-wooled breeds. The fleece is inclined to peel from the belly, leaving this part bare, which not only detracts from the appearance of the sheep, but also lessens the returns in wool.

Value for feeding purposes.—For grazing purposes, the Leicester cannot be said to equal most other breeds, but for fattening when there is little foraging to do, they can hardly be surpassed. They are quick and hearty feeders; being quiet in temperament, they take on flesh rapidly.

Breeding qualities. — The strength of the Leicester in fattening attributes appears to weaken their breeding qualities. Being inclined to take on flesh very readily interferes with the qualities of the breeding flock, for reliability in breeding, prolificacy, and good nursing qualities are not usually associated with a marked tendency to fatten.

Adaptability. — As a breed, the Leicester is adapted for the conditions of the lowlands where the feed is abundant, requiring very little foraging to get it. The Leicester ram has been a prime favorite for crossing on ewes of other breeding for the purpose of rearing early fat lambs. In the formation of other breeds, the Leicester and the Southdown have played kindred parts, as there is hardly a breed of long-wooled sheep but have had at some time in their history an infusion of Leicester blood, while the same may be said of the Southdown and its relation to the dark-faced breeds.

The Border Leicester

There is some doubt as to the material used in making this variety of the Leicester, though there is no uncertainty about the source of the breed. It is asserted by some that the Cheviot cross was employed, while others maintain with reason that there is no proof of this and that the variety is descended from the Bakewell flock. The Leicester-Cheviot being so popular in Scotland since an early day, it is hard to believe but that an infusion of Cheviot blood may have found its way into the flocks of the Border variety, but as there is no direct evidence of this, there is no right for its assumption. An early writer refers to the importation made by Messrs. Culley by stating that in Northumberland the Leicester sheep are the universal stock of the low grounds. Continuing, this authority states that they were first introduced by Messrs. Culley about the year 1766 from the founder of that breed, Mr. Bakewell of Dishley. According to Professor Wrightson, it was in 1763 when George Culley visited Dishley, and at that time the Bakewell sheep were in high repute. Culley brought some Leicester rams from Bakewell and continued to do so for several years. The Culleys' stock, according to Professor Wrightson, is looked upon as the original strain from which the Border Leicester were derived. The Culleys retired in 1806, and the flock became the foundation for Lord Pol-

worth's flock, which was conceded to be the leading flock of the breed in Scotland. At an early time, the breed was confined to a few of the Border counties between England and Scotland along the Cheviot range, but with the extension of their popularity their home may be said to include many other counties, and they have been successfully introduced in addition to several parts of the world. This class of sheep has been coming into repute for some years past with the English flockmasters, many of whom attend the great Kelso ram sales in Leicester. The Border type is so marked that the judges at once disqualified two English Leicesters which were entered in the ram class. The black spots that were discernible about the head and ears of so many of them tell of their descent from the Leicester. They are small in the scrag, but have fine general substance and size. They also do well on moderate land and bear storms well at the foot of the Cheviots. It is the specialty of the ewes to be very prolific and "milk like goats." They are rather bare on the bellies and have fine but rather light-weighing wool.

Standard for Border Leicester. — In this connection the description of a ram of this breed from a paper read by Hon. H. J. Scott, manager of Lord Polworth's flock, before the members of the Glasgow Agricultural Discussion Society: "Head white, hard and clean-cut; eye clear and prominent; nose black; ears well set and free from blue, but black spots do no harm;

FIG. 14. — A flock of "C" type (Delaine) ewes on the farm of Dr. H. P. Miller, Sunnybury, Ohio.

FIG. 15. — Group of Cotswold rams, winners at Omaha show in 1911. Shown by F. W. Harding, Waukesha, Wis. (Page 61.)

PLATE III. MERINO AND COTSWOLD SHEEP.

neck set well into shoulder with bold gay carriage; strong in neck vein; not ewe necked; shoulders and chest deep and wide; ribs wide and round like a barrel; big through the heart; deep in flanks; quarter long and square; light in offal; bones fine and hard, like a deer; wool 'purly,' fine-lustre wool; well clad all over on belly and testicles; none on head or legs; general frame should be large and roomy; lines straight above and below, immensely wide; standing up well yet not leggy, with a free bold style and aristocratic expression. Fat tegs at twelve to fourteen months old, weighing 23 to 25 pounds per quarter. Wool averages 9 pounds per fleece."

Difference between the two Leicester varieties. — An authority states that "the difference between the Border Leicester and the Leicester is to be chiefly seen in the head, which on the Border Leicester is white and boldly carried, the nose slightly aquiline, the muzzle full, the nostril wide, and the ears erect. The head is clean and free from wool. The English Leicester, unless trimmed and sheared for show purposes, usually carries a tuft of wool on his head, and is also wooled on the shanks. The English has a bluish white face, whereas the Border Leicester face is clear white. In carcass the Border Leicester is the fuller and larger, and the belly is not quite so full in outline, being carried rather more lightly." Another writer verifies this difference in type by saying "the

Border Leicester has more length and massive character than its prototype as augmented by Bakewell." The Border Leicester, aside from type, chiefly differs from the English Leicester in that they are better foragers, which in connection with great vigor of constitution enables them to withstand with more success the exposure attendant on living in the rugged country.

Value of Border Leicester for crossing on hill sheep. —For crossing on ewes of the Cheviot or Blackfaced breeds, the Leicester ram is the most popular agent in Scotland. This method of crossing is quite generally used, for it has been found that the half-bred sheep makes an unusually vigorous and hearty feeder; one that is easily made fat for the market. The quick fattening qualities of the Border Leicester, together with the size and weight of fleece it gives, is supplemented with the vigor, fine milking qualities, and fine wool of the Cheviot ewe.

Crossing on fine-wooled sheep. — In New Zealand and Australia, where mutton rams have been extensively used to improve the common Merino flocks to supply the demand for dressed meat and also meet the conditions of the wool markets, the Border Leicester has been extensively used, and the cross has given fully better satisfaction than any other. In presenting the views of the breeders in New Zealand on this point in tabular form, Mr. Robert Bruce credits the Border Leicester with a score of 88 out of

a possible 100, while next to it comes the Leicester with a score of 84. The leading merits credited to the Border Leicester for this purpose are its aptitude to fatten, hardihood and soundness, from a mutton standpoint, giving both weight and quality, while in fleece it is ranked noticeably high because of its quality. In respect to its suitability for crossing on fine-wooled stock, the Border Leicester is considered perfect by this authority, as it receives the full score allowed for that feature in the table.

The Cotswold (Figs. 13, 15, Pls. II, III)

There is some doubt as to the existence of sheep in Great Britain before the time of the Roman Conquest, as Cæsar does not make specific reference to them. However, it is generally thought that in the passage where he makes reference to "cattle loaded with fleeces" he had sheep in mind, and if so, it is but proper to assume that they were Cotswold sheep, for no other variety at that time would be so likely to conform to this description. Better evidence of the antiquity of this breed is afforded, however, by the fact that the hills which the sheep inhabit take their name from the sheep instead of the customary ruling of the sheep taking their breed name from their native district. Camden, referring to this, states that "Cotes" referred to the houses in which the sheep were folded, and "wold" to an open, rolling

upland, and these two terms were merged in the present breed name, Cotswold. The "cotting" of the sheep was a practice introduced from eastern countries, and the occurrence of the word "sheep cote" in biblical literature gives a further claim to antiquity for the breed. The first specific allusion to the breed by name is stated to have been discovered by Rev. E. A. Fuller, an eminent antiquarian, who in the study of the medieval history of the town of Cirencester, the center of the Cotswold district, found the record of a contract of about the year 1319 in which one of the richest wool merchants agreed to pay $11\frac{1}{2}$ marks per sack for "Coteswolde" wool grown on an estate in the center of the Cotswold country.

A later reference to this breed, yet one sustaining their claim to rare antiquity, is the recorded account of the present of twenty Cotswold ewes and four rams from Edward IV to the King of Aragon of Spain in 1464. Stowe in his chronicles refers to the license granted King John of Aragon "for certain Cotswold sheep to be transported into the country of Spaine where they have since mightily increased and multiplied to the Spanish profit." Markham, writing during the reign of Elizabeth, refers to the Cotswold as a big-boned, long-wooled sheep, and, after stating that "Coteswold" derives its name from the country and the sheep cotes, makes the further comment: "Upon these hills are fed large flocks of sheep, having long

FIG. 16. — A winning Lincoln ewe at American shows in 1909. (Page 67.)

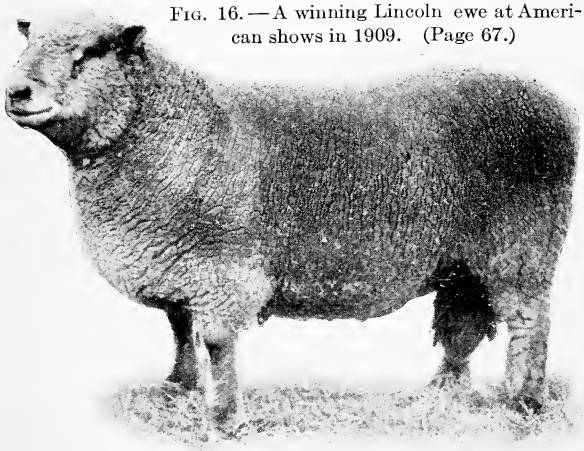


FIG. 17. — A Southdown ram shown in 1911 by C. Leet, Mantua, Ohio. (Page 74.)

PLATE IV. LINCOLN AND SOUTHDOWN SHEEP.

necks and square bodies, by reason, it is supposed, of their hilly and short pasture, whose wool is much valued in foreign nations."

Home of the breed. — The Cotswold hills include an elevated area of about 279,800 acres, the general height of which, omitting the highest points, has been estimated to be from 500 to 600 feet above the sea level. This range of oölite hills has been described as running northeast to southwest and occupying the eastern division of Gloucestershire. The soil of the district, according to the same authority, seems peculiar in that it is so free and open as to be naturally well drained, and though varying much in quality still retaining the same outward character, being calcareous and marly. The Cotswold country seems to be intermediate between lowlands and mountains, and contrary to the habit of most long-wooled sheep, as noted by Professor Wrightson, it has made its home on land approaching most nearly to bleak uplands.

Improvement of the Cotswold. — The Cotswold at an early day was noted chiefly for its large size, rugged constitution, and the fineness and weight of its fleece. It was wanting in early maturity and in carcass from a butcher's standpoint. There is no doubt but that the Leicester was used as a cross upon the original Cotswold to secure an improvement in these features. Writing in 1850, an authority states that the Cotswold sheep of that day was the improved

Cotswold and the new Leicester. The influence of the Leicester infusion was to reduce the size of the sheep, refine the bone, and add to the mutton points of the carcass, while it also made coarser the fleeces and increased the liability to diseases attendant on a weakened constitution.

Appearance of the Cotswold. — The typical Cotswold is a sheep of noble bearing, massive in structure, affluent in wool-production, and having withal a commanding presence. With legs planted squarely so as to truly show the top and bottom lines of a well-developed body structurally exact, and also so that the head may be given the natural pose and carriage with the forelock drooping gracefully, the appearance of the representative of this breed is undoubtedly grand. The face may be white or gray or brown, but short in proportion to the rest of the physique. The forehead should be broad, and from this wide base the forelock should droop long and gracefully in fine spirals. The neck, while short, should spring up rather than straight away from the shoulder. The latter should be flat and well packed, and the back should, to maintain the reputation of the breed, be even, broad, and solid. The width should run back level over the hips and to the end of the rump. Oftentimes fat accumulates in this region, which detracts from the evenness that should be characteristic of the breed. The profusion of long wool over all parts, finer in fiber than in the instance of most long-

wooled sheep, adds to an appearance of size which is fully justified by the weight of the frame.

Mutton qualities. — The Cotswold is a large producer of mutton, and, as is to be expected in such cases, the quality of it cannot be equal to that of the smaller breeds. At Smithfield Fat Stock Show, they have made a good record for rate of gain, but this does not of necessity make a good carcass. In the lamb class in 1882 the prize pen averaged .75 pound per head daily; and in 1888, averaging 288 days old and with an average weight of 184 pounds, the daily gain per head was .64 pound. In the class for wethers over 12 months and under 24, the first prize pen and cup winners averaged 660 days old and weighed an average of 311 pounds, making the daily gain .47 pound per head. In 1889, a pen was shown that averaged 270 days old, average weight 205 pounds, making the daily gain per head .76 pound, which is unusually high. Over three-quarters of a pound per head daily is an exceptionally high rate of gain for lambs, no matter how they may have been pampered.

Wool-production. — The Cotswold is a heavy shearer, the average fleece being about 12 pounds in unwashed condition. The wool grades as coarse combing, as it is rather coarse in fiber, but also long and strong. A fully matured ram representative of this breed will usually shear over 20 pounds of unwashed wool. The fleece is inclined to become cotted

and vary somewhat in its quality on the different parts of the sheep, as on some individuals it grows quite coarse on the thigh.

Grazing qualities. — An early writer makes the intelligent comment on this breed that they are remarkable for the exceptional combination of massive proportions of frame with a constitution adapted to upland grazing on short pasture. Though this breed may not be as strong in constitution as it was at an early day, yet they rank to the fore among the long-wooled breeds at the present time in this respect. For a large breed of sheep they have exceptional ability to do for themselves, being active and vigorous, consequently as grazers they are probably the best of any of the long wools.

Qualities as breeders. — As in the instance of most other large breeds, there is a strong tendency for fat to accumulate on the back and around the tail, collecting in such quantities as to make uncertain breeders. The Cotswold are fine milkers, good nurses, and likely to develop the disposition of good mothers. While not as prolific as some other breeds, yet, when managed with intelligence, the ewes rarely fail to make good lambs of what they do produce, as they milk freely and are attentive to the wants of their young.

Value of Cotswolds for grading. — Being long established as a breed, the Cotswolds are very permanent in character and prepotent as well. They are very

certain in transmitting their qualities to common stock. If the conditions surrounding a common flock are such that the fleece may be more open without working injury to the thrift of the sheep, then the use of a Cotswold ram for breeding purposes may make an improvement in the fleece by increasing the weight of it. And if size is desired, it can be secured through the same source without detracting from the vigor of the flock.

The Lincoln (Figs. 16, 19, Pls. IV, V)

The origin of the breed is obscure. As early as 1749, they are referred to as a sheep of the Fens of Lincolnshire. An early description of this breed describes them as ungainly animals, with a long, thin carcass, thick and rough legs, large bones and thick pelts, attaining a great weight but very slow in maturing. Their chief merit at that time was their wool, which was from 8 to 16 inches long, and their fleeces weighed from 8 to 14 pounds. This feature made them profitable to the lowland graziers, although covering a slow-feeding, coarse-grained carcass of mutton. The same authority notes that Young, fifty years previous, observed the Leicesters were drawing the Lincolns from the poorer lands and improving the latter breed by crossing, and this continued to such a degree that the old Lincolns were scarcely to be found about the middle of the nine-

teenth century. Another authority, writing about that time, in describing this change, says that the long-wooled Lincolns were formerly the only variety produced in the county, and they seemed formed for the then rich marshy soils or cold situations, there being little or no heathland under cultivation. Their principal product was their long, strong wool which protected them against the vicissitudes of the eastern winds upon their bleak open pastures during the winter months. They had, according to this authority, long, white heads and ears, long, thin carcasses with exceedingly large bone, and because of their wool-bearing capacity, they were scarcely ever fattened previous to their third year.

Improvement of the old Lincoln. — When the heaths of Lincolnshire began to be improved, the demand was augmented for a smaller and more compact and earlier maturing sheep to make those waste places fertile. To establish this type, it has been recorded that infusions of Leicester blood were made by a number of Lincoln breeders together hiring one of the most noted Leicester rams of the time for one thousand guineas.

It was not until 1862 that the Royal Agricultural Society of England recognized the Lincoln as a breed, at the Battersea Show. They grew in favor, and in 1888 the American Flock Book was established, and in 1892 the demand for the sheep to export to foreign countries led to the formation in Great Britain of

the flock book for the registration of pure-bred flocks.

The type of old Lincoln. — About fifty years ago, it was said of this breed that none varied more in their character and management because of the fact that they were then bred with a view to suiting both the marsh and the arable districts. There was a conflict of the two types — the old Lincoln and the new with the infusion of Leicester blood. Since then, there has been no need for this outcross, and what we know as the present type has prevailed and become fixed by careful breeding.

The Lincoln may be credited with being the largest of any of the breeds of sheep at maturity. They are massive, strong-boned sheep, yielding large carcasses and heavy fleeces.

The face is white, strong-featured, and the poll is comparatively bare or surmounted with a small tuft of wool. The neck does not rise much above the shoulder, which is broad across the top, and as a rule it is exceptional in being very thickly covered with flesh. The back is very wide, level, and strong. The straightness and strength of the back and its customary wealth of flesh are leading features among the individuals of this breed, though this may be said to be a characteristic more or less an attribute of all the larger white-faced breeds. The width and levelness of the back is continued over the loin and to the end of the hind quarter. The latter fills out so as to

make the sides and the end appear square on top, but very often the fullness does not continue over the thighs and twist as it should.

Live weights attained by Lincolns. — At the Smithfield Show in 1886, three ewes weighed over 1200 pounds, and in 1826 it is recorded that a three-year-old wether weighed 386 pounds, a two-year-old 364, and a shearling 284 pounds dead weight. At the Smithfield Show in 1889 four pens of Lincoln wethers were shown. Their average age was 637 days, average weight 300 pounds, and the average daily gain per head .47 pound. There were also four pens of lambs exhibited. The average age of these was 285 days, average live weight 176.3 pounds, and the daily increase per head .59 pound. These figures are indicative of the heavy weights that the Lincoln will attain to when given an abundance of food and allowed every comfort, that the increase in weight may be as rapid as possible. When the growth is so great, it is not to be expected that the quality of the flesh should be free from coarseness.

Weight and character of fleece. — The Lincoln wool is very long, being from 12 to 20 inches, and is exceptionally lustrous, though coarse in fiber. It is asserted, the characteristic lustre is not retained when the sheep are bred away from their native country. The same authority states that the massing of the wool in flakes or strands upon the animal is characteristic of the breed, but that the fiber is inclined to be hairlike

FIG. 18. — The first prize pen of Southdown wethers at the International Live Stock Exposition in 1910. (Page 74.)

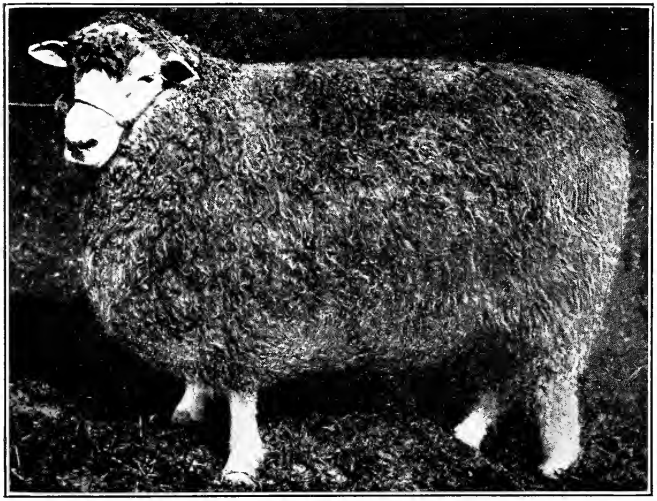


FIG. 19. — An English prize-winning Lincoln ram. (Page 67.)

PLATE V. SOUTHDOWN AND LINCOLN SHEEP.

and lashy. A report from one of the leading flocks in Lincolnshire states that in 1888 the clip of 843 fleeces averaged $12\frac{3}{4}$ pounds per fleece. Another flock report shows that 125 shearling rams produced 18 pounds apiece, 60 averaged over 20 pounds, and four fleeces weighed respectively 23, $24\frac{1}{2}$, $25\frac{1}{2}$, and $30\frac{1}{2}$ pounds. A good breeding flock, it is claimed, will average 12 to 14 pounds per fleece.

Breeding qualities of Lincolns. — Reliability in breeding, prolificacy, and good nursing qualities are features that are valuable in a breeding flock. For reliability in breeding the larger breeds cannot equal the smaller and more active breeds for the reason that they are more inclined to fleshiness, and very often the fat accumulates and overhangs about the hind quarters, so as to prevent service. In respect to the prolificacy of this breed, the basis for the awards of the prizes of the Lincolnshire Agricultural Society may be considered. Three classes of prizes were offered, and in the first class where the number of ewes bred exceeded 300, the percentage of lambs to ewes was 1.28 in the instance of the prize winner; in the second class where the number of ewes bred was between 150 and 300, the percentage of the highest returns was 1.34; and in the third class where the ewes bred exceeded 40, but not under 150, the percentage of lambs was 1.35. It is to be remembered that these are the best results instead of averages, and they appear to indicate that in common

with other experiences, the Lincoln has superiors in this direction, and the same may be said of their nursing qualities.

Adaptability. — Being a large sheep, the Lincoln must necessarily require an abundance of feed, and that within easy reach. It cannot produce a large carcass with its big frame and wealth of flesh and heavy fleece on scanty fare and neglect, for these results are only attained by heavy feeding. Rich and level land that produces luxuriant herbage and heavy crops constitute the chief requirements for any farm that would grow these sheep successfully.

Value for grading. — The Lincoln as a breed has long been established, hence the rams are prepotent in transmitting their qualities. Under conditions where it is desirable to increase the size of the sheep in a flock, the Lincoln ram is a satisfactory agent to use. Heavier weights of carcass and fleece may be obtained in this way. Large numbers have been exported from Great Britain to be used on the flocks of Merino descent in New Zealand, Australia, America, and the Argentine States. They have been popular for this purpose chiefly because of the increase in size and weight of fleece which results from the cross. The lightness, lustre, softness, and length of fine fiber which characterizes the cross-bred wool makes it in demand when put on the market.

Differences in the Lowland Breeds

Of the three breeds, Lincoln, Leicester, and Cotswold, the Lincoln is the largest in size and the coarsest in frame and fleece, while the Leicester is the finest in bone and smallest in size. The head of the Lincoln is larger and longer than that of the others, and like that of the Leicester it has only a small tuft of wool surrounding it, while in the instance of the Cotswold the long forelock falls over the face. The neck of the Lincoln and the Leicester as a rule is shorter than that of the Cotswold, and as it is straight, the head is held almost in a line of the body. In the Cotswold, the neck rises more erect from the body, giving the head a carriage and poise that adds greatly to their style. The body of the Lincoln is apparently fuller in its development, having a greater depth of flesh usually on the back, while the Cotswold and the Leicester may claim an advantage in the length of this part. The fibers of the Lincoln fleece are very loose and strong, and they mass together in heavy flakes. The wool of the Cotswold, while long, is comparatively fine, though it differs very much in crimp. In some fleeces the fibers are very wavy and massed, and the crimp very uneven, while in others they are not the least cotted, but fall away in light locks with the "pirls" that are characteristic of the Leicester. The Leicester fleece is lighter and inclined to be more open than the others,

and the locks have a peculiar curliness or evenness of crimp from end to end that is quite distinct from the open waviness of the Lincoln and Cotswold fleeces.

While these breeds are especially adapted to lowlands, their extra weight and tendency to run to fat do not give them the popularity in the markets that is accorded those breeds that come to maturity at smaller weights. In some sections where the rainfall is excessive, the long-wool type of fleece carries the water from the body better than do middle or fine-wool fleeces, and thus affords a practical advantage as well as the one of length of staple. Cotswold and Lincoln blood have been used extensively in range breeding to maintain size of frame and length of staple.

The Southdown (Pls. IV, V, VI)

The native district of the breed exists in the Downs of Sussex, a range of chalk hills which assume the form of a bow in the county of that name. The following description will exactly locate the home of these sheep. "If the reader will glance at the geological map of England and trace the boundary of the great chalk formation in that country, he will see that it is, roughly speaking, the form of a bow or the arc of a circle, the bow being formed by the eastern coast of Hunstanton and traversing the west

PLATE VI.

FIG. 20. — A Southdown ewe flock. (Page 74.)

of Norfolk close to Ely and by Hitchen, Princess, Risborough, Wallingford, Swindon, and Shafterbury joins the other extremity of the bow near Dorchester. This, broadly speaking, is the chalk formation of England, although it is not always visible, being covered in places by subsequent formation of lowden, weolden, bowlder clays, and sands, and throughout the district from the northern to the southern extremity will be found representatives of the Southdown breed of sheep. These downs are chiefly of a chalk formation, and vary in altitude from four hundred to one thousand feet." Another writer presents a contour of the country as follows: "The name of this breed is taken from the range of chalk hills which, running in an easterly and westerly direction through the northern portion of the counties of Kent, Sussex, Hampshire, and Dorchestershire, are known generally as the Southdowns. Their elevation," he continues, " is nowhere very great, their breadth ranges from one mile to six or eight, and their surface is firm and dry and covered with a close, short, and sweet herbage. On the south they dip towards the sea; on the north they are bounded by the lower chalk or the weolden formation." From these writings it is evident that the home of the Southdown consists of rolling upland chiefly of chalk formation, thus insuring sweetness of soil and a growth of nutritious herbage.

Origin of the Southdown. — It is safe to assume

that the Southdown may claim precedence over any of the Down breeds in length of lineage, and their claim to being the oldest breed of British sheep in existence has as good support as that of any other. Their history dates from the time of their improvement, but that they inhabited the hills from which they derive their name for many years previous to this is clearly established. For time immemorial the Southdown as a breed has had the patronage of the nobility and landed gentry. Mr. Thomas Ellmann, the son of John Ellmann the first improver of the Southdown, in an address before the Royal Agricultural Society of England, spoke as follows: "If we attempt to trace the origin of the Southdown breed of sheep, their natural character at once indicates that they are a mountain race and well adapted to the Southdown hills; and we may fairly infer, in the absence of any authenticated statement, that they hardly existed on the island before the Roman Conquest, but before the earliest time the Southdown hills with their short, fragrant pasturage and dry, healthy situation must have been the most natural home for this sheep. The first distinct record concerning these sheep relates that about two hundred years ago sundry flocks feeding on these downs were annihilated by a disease called 'small-pox,' which was imported from Holland. From this date some attention was paid toward mixing this breed, and pains were bestowed on its improve-

ment. Mr. Arthur Young, in speaking of the Southdown sheep in 1788, admired their hardy constitution, their usefulness in manuring the land, and the fine flavor of the mutton. In 1794, when continuing those essays, which all the world has admired. he speaks of the Southdown sheep as natives, which for many years had existed on the Southdown slopes. At the first show of the Royal Agricultural Society of England, in 1839, there was a class for Southdowns, and at each show since then they have contributed in a large degree to the merit of the sheep exhibits."

Improvement of the breed. — The original Southdowns were first described by Arthur Young in his essays published in 1794 as being of hardy constitution and noted especially for the fine quality of mutton they produced. Another writer states that before the era of improvement began, the Southdowns were of small size and far from possessing good points; being long and thin in the neck; narrow in the forequarters; high on the shoulders; low behind, yet high on the loins; sharp on the back; the ribs flat, drooping behind, and the tail set very low; good in the leg, though somewhat coarse in the bone.

Work of John Ellmann on the Southdowns. — These were the sheep that John Ellmann of Glynde began to improve about the year 1780. He gave fifty years of skillful attention to their breeding, and

during that time made remarkable progress by careful selection and judicious management without any assistance from an outcross. As indicative of the remarkable improvement which Ellmann made, we are told that in 1786 he was only able to get $4.38 a head for 80 ewes, but in 1800 he sold 200 ewes for $12.50 per head. In 1787 he sold a ram for $50, but in 1800 he obtained $1500 for the use of a ram for two seasons. The reputation of his flock became worldwide, and in 1798 the Emperor of Russia bought, at the cost of 300 guineas, two rams from Mr. Ellmann to improve the flavor and quality of northern mutton. In referring to the aim of John Ellmann as a breeder, his son makes the following statement: "In several points my father's aim differed from that of his distinguished contemporary, Bakewell, the founder of the improved Leicester. It was Bakewell's idea to obtain the maximum of mutton with the minimum of bone. He disregarded wool in comparison with mutton and was the advocate of rapid development. My father, on the other hand, objected to forcing the young stock and was anxious to maintain strength of constitution, and then at the outset he was driven to a little inbreeding from the difficulty of obtaining good animals from others, yet as his improvement advanced he acted likewise." It is generally understood that Ellmann's success was due to close selection. An authority makes the following statement:

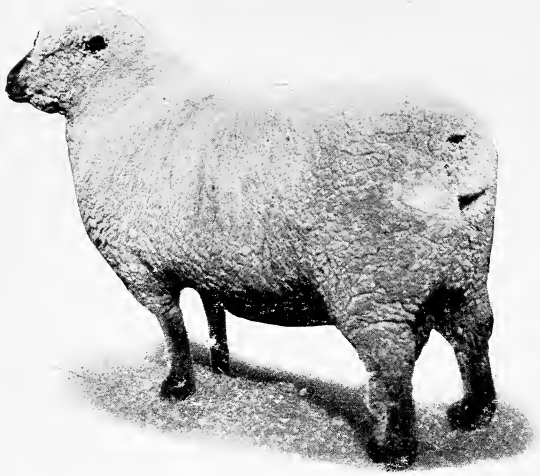


FIG. 21. — A good type of Shropshire ram. (Page 86.)

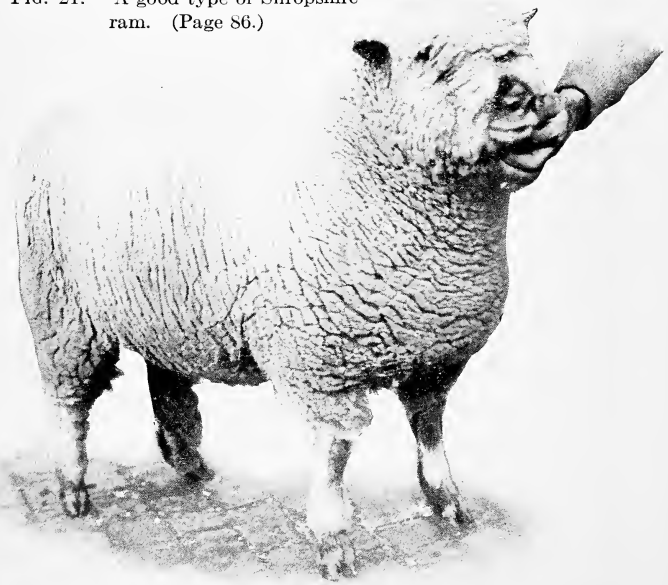


FIG. 22. — The champion American-bred Shropshire ewe at the International Live Stock Exposition in 1911. (Page 86.)

PLATE VII. SHROPSHIRE SHEEP.

"I say that in fifty years' experience, I never knew a flockmaster in the county or out of it who had better sheep than others, but the improvement was to be traced to Glynde. The mode adopted and still continued that produced so much perfection is in the choice of the ewes to the rams and the constant attention to the produce from such selections." It has been stated that some infusions were made of Leicester blood, but there seems to be no exact evidence of it.

Improvement of Southdowns by Jonas Webb. — Mr. Ellmann began his work about the year 1780 and retired in 1829, and it was in 1823 that Jonas Webb commenced to devote his attention to the improvement of the Southdown. In 1824 the following description was given of the Southdowns, indicating what they were when Jonas Webb began his work: "Their legs and faces were gray; they have fine wool, which is from two to three inches long and weighs from two and a half to three pounds per fleece. They were slightly deficient in depth and breadth of chest, but the mutton is excellent and highly flavored; they are kindly breeders and when fat the average weight may be stated to be fifteen to eighteen pounds per quarter." From the report of the Southdown Club Show of 1827, the following extract is taken to indicate the character of the Southdown at that time: "In the sheep classes of that year the Leicesters did not come up to their previous strength

of merit. The Southdowns, on the other hand, were declared to be better than at any previous occasion. The majority of those exhibited proving how nearly the Southdowns bred in that day 'approached the Leicester in correct form,' the last two words italicized in the original report; and certainly," the reporter adds, "there are other valuable indications of the first order." Mr. Webb's aim was to make a larger sheep than that bred by Mr. Ellmann and still retain all the desirable qualities of the Southdown. Mr. Webb purchased his foundation flock from Mr. Ellmann and finally became his successor. The aim of Mr. Ellmann was to improve his sheep in form without adding especially to their size and to maintain the original hardiness and recognized characteristics of producing mutton of the highest excellence. Mr. Webb thought an increase in size desirable, and worked with this in view, retaining, however, the true type and essential points of the pure-bred Southdowns; namely, beauty of form, strength of constitution, with excellence of wool and mutton, the latter unsurpassed by any other breed. Contrasting the aim of the two breeders still further, the following clear statement presents the difference according to Mr. Henry Wood, who says: "Here I would venture to remark that while the owners of the flocks of which I have just spoken were scrupulously careful to maintain the purity of the breed, each aimed at a different type of animal. 'Small

and good' sheep were clearly Mr. Ellmann's aim; Mr. Webb's, 'large and good.' Believing that large sheep were much the best and would be the sheep of the future, I need not say how well Mr. Webb succeeded in producing animals of large frame and greater weight than the Southdowns of Mr. Elmann's day; while at the same time, retaining the true type and all the essential points of a pure-bred Southdown sheep." Mr. Webb's honors and successes have been many. It is unnecessary to recount his winnings at the Royal and other shows; it is sufficient to say that he has sold rams for as much as 250 guineas, the price a yearling brought in 1860. In 1861 and 1862, the flock was dispersed, bringing 16,646 pounds. The Southdown has made an exceptional record for prize winning in the leading shows of both continents. The first noted victory to draw the attention of the world was at the Paris Exposition in 1878, when the Southdowns shown by Lord Walsingham carried off the first prize of 1500 francs offered for the best pen of butcher's sheep, and also the grand prize for the best pen of sheep of any foreign (other than French) breed.

Appearance of Southdowns. — In contrast with the type of most other breeds of sheep, the Southdown is very low, level, and compact in construction. There is an absence of waste in bone, flesh, or fleece, which no other breed can approach. Quality which is antagonistic to waste is the leading feature of the

Southdown. Combined with this, there is a levelness of top lines and a straightness of lower lines and an association of these with symmetrical development that makes the Southdown the model sheep from the butcher's point of view. Careful breeding for centuries has given the Southdown an evenness of quality in all features and such a dearth of deficiencies that they cannot be approached for trueness of type and an even balance in essential characteristics. The true type of the Southdown is strong in its compactness and even development of carcass. An estimate of the live weight is invariably deceiving because of lowness of the body, the solidity of the structure, and absence of coarseness in any form.

Description of ideal Southdown. — The following description of the qualities of a good Southdown appears in the English Southdown Flock Book: "In a good Southdown we look for a head wide and level between the ears with no sign of slug or dark poll; eyes large, bright, and prominent; ears of medium size, covered with short wool; face full, not too long from eyes to nose and of one even mouse color, not approaching black nor speckled with white; under jaw, light; neck wide at base, strong and good; shoulders well put in, and top level with back; chest wide and deep, 'thick through the heart'; fore flanks fully developed; ribs well sprung and 'well ribbed up'; back level with wide and flat

loin, the whole covered with firm flesh; flanks, deep and full; rump, wide, long, and well turned; tail, large and set on almost level with chine; thighs, full, well let down, with deep wide twist, insuring a good leg of mutton; legs, a mouse color and 'outside the body'; the whole of which should be covered with a fine, close, even fleece down to the hocks and knees and right up to the cheeks, with full foretop, but there should be no wool around the eyes or across the bridge of the nose. The skin should be a delicate and bright pink, the carriage gentlemanly and the walk that of a thoroughbred." In recent years, Southdown breeders are cultivating the tendency to the growth of wool on the face.

Production of mutton in the Southdown. — The discussion of early maturity usually discloses two common views of it, the one considering only the rate of gain and the other the rapidity with which animals become ready for market from the time of birth. It is evident that it is possible for an animal to make very rapid gains and yet not be finished for market at any time. While the Southdown cannot surpass some other breeds in rapidity of gain, yet in respect to the dispatch with which they may be fitted for market, they are among the leaders. The Southdown is so fine in quality and so smooth and level in form, that they are ripe for market some time before the other breeds. At the Smithfield Club Show in 1887, the Southdowns did not make as good a

showing as in later years. The best pen of wether lambs made .59 pound daily per head, as they averaged 175 pounds at an average age of 295 days. In the class for yearlings, the best gain was .36 pound per head daily, the average age being 622 days and the average weight 225 pounds. In 1888 they redeemed their record, since the champion plate for lambs was won by a pen of Southdowns that made the average daily gain of .60 pound. They weighed 112 pounds when dressed, averaging 64.36 net to gross weight. Their average age was 291 days and their average weight 174 pounds. In 1890 the best gain made by Southdown lambs was .59 pound per head daily by a pen averaging 166 pounds at an average age of 291 days. These results show that while the Southdown has not made as large gains as some others, yet when judged as fat stock, they have succeeded in winning the championship more frequently than any other.

Quality of mutton. — Under the conditions of its native environment, the Southdown produces an exceptionally fine quality of mutton, being fine in texture, well flavored, and nicely mixed in proportion of fat and lean. When too closely confined and fed under conditions at variance with their habitat, these qualities are apt to disappear and the mutton becomes surcharged with fat. On this point it will be interesting to quote Mr. T. Ellmann, the son of the first improver of Southdowns: "So great

indeed is the effect of climate and soil, that the fine flavor of the Southdown mutton may be changed in time to the coarse, tallowy meat of the Leicester or other long-wooled sheep. Nor will the flesh alone be interfered with, but the wool and every feature will become similar to those of the nature of the different localities." This explains how it is that sometimes the Southdown mutton does not retain its marbled character. The characteristic of the Southdown breed is to make an unusually fine quality of mutton with little offal, as the development of the meaty portions of the carcass is abnormal and the fineness of the structure exceptional.

Qualities of the fleece. — The wool of the Southdown is fine in fiber, and the fleece is unusually dense, though not heavy. The fiber is short and fine and very even in quality over all parts of the body. This trueness in quality in all parts of the fleece is reliable evidence of the carefulness with which they have been bred for decades. Hairiness or the presence of dead hairs in a Southdown fleece is a rarity.

Attributes as breeders. — As a breed, the Southdown has a permanency of character that has resulted from the long establishment of the breed. There is a persistency of type among the Southdowns that adds greatly to the certainty to which they will reproduce their characteristics, and this in turn insures pleasure and profit in breeding them. In prolificacy and other material qualities, they do

not take such a prominent position as that which is rightly theirs in the mutton market. Being possessed of vigorous constitution, and also having been bred for definite qualities for a long time, the impressive qualities of the Southdown when used on other strains are very strong.

Adaptability. — Being active and vigorous, the Southdown is a good grazing sheep; one possessed of the attributes of an excellent forager. They are easy keepers, and this in association with their activity and hardihood adapts them to rolling lands, where they are required to live an active life. When kept under environment characterized by abundance of food, the breeding flock is likely to take on flesh too heavily for the thrift of the sheep and the vigor of their lambs. The demand that exists in our market for fat stock requiring a live carcass weighing 90 to 100 pounds when finished for market gives the Southdown with its smooth, plump form at that weight another leading advantage in their adaptability for mutton purposes.

The Shropshire (Pls. VII, VIII)

The home of the Shropshire, in a general way, may be said to be the Midland counties of England. In a prize report of the Agriculture of Shropshire, an early historian, after describing the Shropshire sheep, writes of their native district as follows:

PLATE VIII.

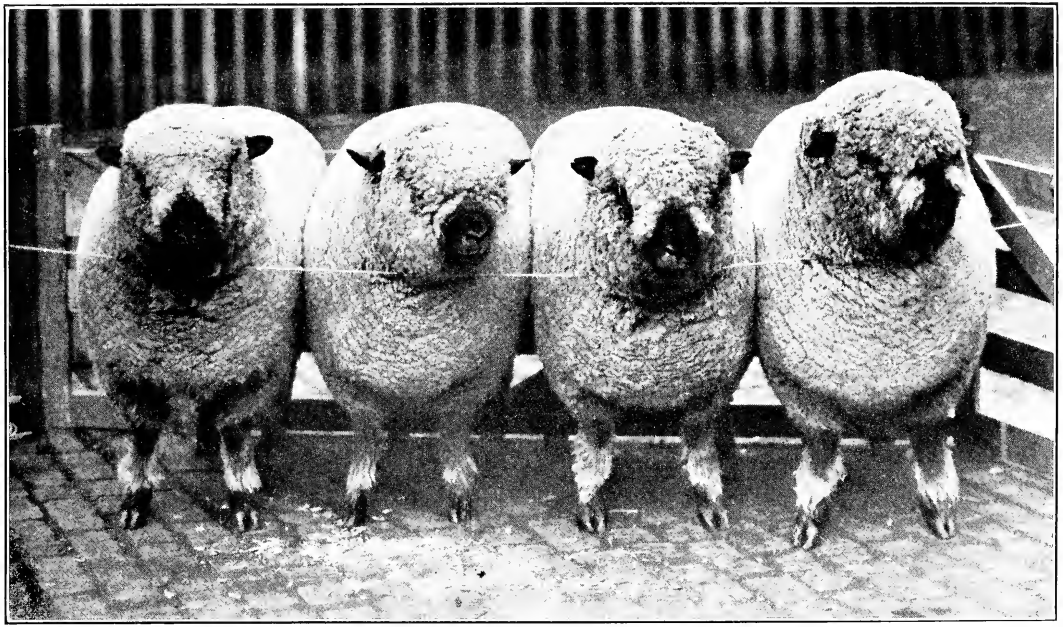


FIG. 23. — Winners of premium for four Shropshires, the get of one sire, at International Live Stock Exposition in 1911. (Page 86.)

"This may be distinguished as the district of Cowe Dale as it includes and consists chiefly of this far-famed valley. It is inclosed on the west by a range of limestone hills, extending from Easthope in a southwest direction to Westhope; on the east it is bounded by the Clee Hills and the rising land of district number one, and on the south it reaches to the borders of that county. A reference to the map will show it to be a narrow but long strip of land, varying in width from one and one half to four miles, and about twenty miles in length and containing about 35,000 acres. It is a tract of land possessing much interest on account of its fertility and the general appearance of prosperity which distinguishes it. . . . It spreads beneath this venerable castle like a carpet of verdure of the richest character, and the luxuriance of vegetation at once strikes the beholder with the feeling that he is viewing one of the most fertile of our English vales. The surface is slightly undulating, just sufficient to give variety to the landscape. The soil is chiefly alluvial deposit of good quality. As we rise towards the hills that bound the Dale, it gradually decreases in depth. It forms a loamy soil occasionally becoming a stiff loam, especially in the northern portion of the Dale. We also find drifts which are gravelly in their nature, as between Onibury and Ludlow, but these are generally narrow portions of no great extent." But all the breeding districts of the county

of Shropshire are not as prepossessing as that just described. Writing of another portion of the county where the best and choicest flocks were bred at that early day, the same authority says: "The south portion of this district is dotted over with a number of hills such as Hopton Hill, Caer Caradoc, and many others give great boldness of character to the scenery and render the land exceedingly irregular and uneven; level ground can scarcely be seen, except along the base of the valleys which twine amongst the numerous hills. The soil is generally light, often quite sandy, and at other times thin and near the rock; most of it is poor and of inferior quality, but along the valley there is land of good quality. This portion of the district is bounded on the west by Welsh hills, and on the east by the hills which prolong the Wenlock Edge. From amongst these also many valleys run into the district and, by their superior quality, add much to its general fertility. . . . At Shrewsbury we find some land of first-class quality, varying from strong, rich loams, to sandy loams of inferior value." Another writer in a description of the early Shropshires says: "In our early records of sheep-farming, Shropshire is described as possessing a peculiar and distinct variety of sheep, to which the name of 'Morfe Common' was given from the locality to which the breed was principally confined. This is a tract of land on the border of the Severn near Bridgeworth, which, originally of vast area, has of

late been considerably diminished in extent under the influence of cultivation and the generally improved condition of the country." It appears also that two heath varieties also contributed to the foundation of the Shropshire, and their native districts were the Longmynd range in Shropshire and Cannock Chase in Staffordshire.

Original sources of Shropshire. — The foundation material used in establishing this breed were the sheep known as Morfe Commons, the Longmynd sheep, and also those of the Cannock Chase. A writer, referring to the evolution of the Shropshire, sums it up briefly as follows: "The original heath breeds of the Longmynd range in Shropshire and Cannock Chase in Staffordshire, having horns and black faces, were improved first with Southdown blood and afterwards by selection until the present Shropshire breed was established. Two of the most celebrated founders of the breed were Mr. Samuel Meire, who made use of both Southdown and Leicester blood, and Mr. George Adney, who, beginning with a sheep descended from a Southdown cross, brought his flock to extraordinary perfection by selection and breeding." Plymley, in his "General View of the Agriculture of Shropshire" (page 260), published in 1803, says of the Longmynd sheep: "There is a breed of sheep on the Longmynd with horns and black faces that seems an indigenous sort; they are nimble, hardy, and weigh near ten pound

per quarter when fattened. Their fleeces upon an average may weigh two and one half pounds, of which one half pound will be brechen or coarse wool and is sold distinct from the rest. The farmers of the hill country seem to think the greatest advantage they derive from the access of foreign stock is from the cross of the Southdown with the Longmynd sheep; the produce they state to be as hardy and to bite as close as the Longmynd sheep, and the weight of the carcass is increased."

In 1792 the sheep of England were subjected to the investigations of the Bristol Wool Society, and they reported on the Morfe Common sheep as follows: "On Morfe Common near Bridgeworth, which contains about 600,000 acres, there are about 10,000 sheep kept during the summer months which produce wool of superior quality. They are considered a native breed — a black-faced or brown or spotted faced, horned sheep, little subject to either rot or scab, . . . clipping nearly two pounds of fleece exclusive of the breeching, which may be taken at one seventh or one eighth part of the whole." The writer who quotes the foregoing continues: "This appears to have been the original stock from which the present breed of Shropshire Downs has sprung. As the country advanced, and the breed became more valuable for their carcasses as well as for their wool, the Morfe Common sheep were crossed with other breeds, but more particularly with the long-wooled

Leicester and Cotswold or the short-wooled Southdowns."

Improvement of the early Shropshire. — The sheep that were the original source of the Shropshire were noted chiefly for the high quality of the wool that they produced. In a prize report on the Agriculture of Shropshire, the following occurs: The quality of the Shropshire Down wool is exceedingly good, and the fleeces average good weight. The fleeces from ewes average from five to eight pounds; wethers fifteen months old, seven to eight pounds; yearling rams, eight to twelve pounds; but this excessive weight is generally accompanied by coarseness, which depreciates the value of the fleece. As far back as the fourteenth century, we find the Shropshire wool considered the choicest in England. . . . Subsequently in a work published in 1694 ("The Interest of England," page 4) it is stated: "Our Shropshire wool is not to be equaled in its kind by any part of the world and is suitable to almost any degree of quality." Another early chronicler says: "The account previously given of the price of Shropshire wool (£9 6*s.* 4*d.* per sack), the highest in England, is in a great degree confirmatory of this opinion, and was composed most probably of the fleeces of the more common sheep, which were so long the pride and boast of Shropshire, produced as they did the finest wool in England, the superior to the Rylands." From this and the facts previously

presented, it is clear that the chief characteristics of the original Shropshire was the production of a very fine quality of wool. At a meeting of a farmer's club in the county of Shropshire, Mr. J. Meire, the first improver of this breed, is quoted as saying: "It is not attempted to be denied that the Shropshire is a cross-bred sheep. The original herd was horned, and the first attempt at improvement was to get rid of these incumbrances; and there is little doubt that this was effected by a cross of the Southdowns. This sheep was well adapted for the Downs, but for the inclosures of the Shropshire something more docile was required; consequently recourse was had to the Leicester." In discussing the work accomplished by Mr. Meire, another writer describes the source and direction of the improvement as follows: "Mr. Meire was a good judge of stock and set to work upon the coarse Shropshire, going chiefly for these points — straight spine with well-sprung ribs, oblique shoulders, and good rumps. These points could not be obtained by cultivation and selection alone, and Mr. Meire introduced the Southdown, buying or hiring rams from the late Mr. J. Ellmann, of Glynde. Aptitude to feed, with short back and chine, were derived from a cross of Leicester blood introduced with great judgment. Having thus obtained what he desired from us, Mr. Meire endeavored to fix the same by close breeding." Another authority indicates the improvement that

was made as follows: "Mr. Meire, the great Shropshire improver, first used Leicesters on the Shrops to give them fatter backs, and then Southdowns to darken their faces." There is abundant evidence in the foregoing statements to indicate that the Shropshire derives its merits from many sources.

Attaining the status of a breed. — The first Shropshires to attract public attention were shown by Mr. Samuel Meire of Castle Hill near Much Wenlock, Shropshire, at the Royal Agricultural Society Show at Gloucester in 1853. The record in the Journal of this society for that year notes that Mr. Meire's exhibit received recommendations. Mr. R. Milward in a report on the exhibition of Live Stock at the Gloucester meeting of the society says: "The new class of Shropshire Downs was very successful; it is to be hoped that the society will recognize them as a distinct breed." This is the first official reference to the Shropshire. The sheep shown must have been of some merit to be worthy of this recommendation, which, however, was not acted upon until some years later. It was not until 1859 at the same society's show, that the Shropshire again made a notable exhibit. Representatives of the breed were shown in the class "Short-wooled (not Shropshires)," and in the competition for the special prizes offered for Shropshires, there were eight flocks represented and a dozen others included among the list

of recommendations. In 1860 we find the Shropshire awarded a distinct class with a large number of flocks represented. Referring to this exhibit, one of the judges stated: "Perhaps no description of sheep excited more interest in the show yard than these. It is only within the last eight or ten years that they have come prominently into notice; and it was not until the Canterbury show last year that their claims to be considered a distinct breed were recognized by the Royal Agricultural Society. Yet here we find them in greater numbers than any other breed of sheep shown; . . . it is impossible not to be struck with the appearance of these sheep, as a most useful, rent-paying kind of animal; and if they have not yet attained that uniformity of character, which we are accustomed to see, in some other herds, it must be admitted that they possess all the elements which are required to constitute a near approach to perfection, and all the Shropshire breeders have to do is to concentrate these qualities by a careful and judicious selection. In the class for yearling rams, upwards of fifty were shown, most of them heavy-fleshed animals of considerable merit; a few indicating the effect of crossing with the Southdowns, more or less remotely, and possessing less size and robustness of character, though with more compactness of form, and finer but lighter wool. It would, we think, be well for the breeders of these sheep to bear in mind that the qualities which have

brought them into notice are — their aptitude to produce great weight and quality, both of mutton and wool combined, with early maturity, while they will bear to be stocked more thickly than other breeds of equal weight." There is good evidence of the popularity of the Shropshire, even at that early day, in the fact that larger numbers were shown than of any other breed. The same has been true since. The Stewards of Stock at the same society's show report in 1864 that "the Shropshires form, we believe, the largest of any of the sheep classes at the Royal meeting of the present year, the numbers entered being as follows: shearling rams, 46; older rams, 9; shearling ewes, 10. This number of entries we consider comparatively large, taking into consideration the distance at which the show is held from the counties whence they sprung. We have great pleasure in recording our opinion that the Shropshires exhibited at Newcastle are, with a few exceptions, uniform in character and quality, and combined good size and weight with excellent wool-growing properties; and that they are in all respects well calculated to maintain their position as a useful and profitable breed, and to obtain the favor of those persons who study the breed and animals capable of producing at once a high class and plentiful supply of mutton and a heavy fleece of good wool. In making our selections, we have endeavored to adhere to the type we con-

sider best calculated to maintain the reputation of the breed, and to promote the advantage of sheep breeders and the public generally; and while we have kept in view the importance of producing a heavy fleece, we have not forgotten the necessity of recommending the animals most capable of producing muscular flesh, and those best calculated in their own natures to perpetuate a symmetrical, heavy, and hardy sheep. We are pleased to note that the general excellence of the class of shearling rams caused us much struggle in making our decisions, no fewer than eighteen specimens being ordered by us into the ring to make our final selections from, and we do not hesitate in pronouncing them to be the best eighteen sheep we ever saw together." In 1884, when the Royal Society's Show was held at Shrewsbury, a central point in the native district of the breed, eight hundred and seventy-five Shropshires were exhibited, which were twice as many as the number from all other breeds. In 1883 the first volume of the Shropshire Flock Book of Great Britain was issued, the first British sheep register to be printed. In 1855 the breed first came to America; and in 1884 the American Shropshire Registry Association was formed, and the first volume of their record issued in 1889.

Type of the Shropshires. — The strength of the Shropshire is the degree to which they combine mutton and wool qualities with the type that does best

as a useful breeding sheep. They are neither large nor small, for in comparison with the smaller Southdowns and the larger Oxford, they may be said to be of medium size. The typical Shropshire is hardly equaled in style, as the head is held in easy poise by the neck, which rises erect from the shoulder, and not stuck straight forward as on some other breeds. The body runs straight from the turn of the neck to the top of the tail, and in best representatives, the back is flat and solid, and not narrow and sharp. The length and depth of the hind quarter is a feature of the carcass that has improved greatly within recent years. The inclination to be short and sharp behind has been corrected by careful attention in breeding. A feature that has contributed to the style of the Shropshire is the manner in which the legs support the body. In the most attractive type, instead of the legs standing under the body, they are squarely placed at the four corners of it. The closely knit frame of a typical and vigorous Shropshire, wrapped in a fleece of dense and fine fiber, from the bridge of the nose to the hind heel, presents a picture of as much indifference to the storm's course as it would seem possible to make from all the attributes of sheep life. In the ram the head should be strong in features, without coarseness, wide between the eyes, comparatively short, and also wide in the muzzle. The eye should be large, and as near as possible the crystal clearness of

spring water. The small, erect ear should be sharp, pointed, and not heavy or pendulous. The nose and face should be a rich brown, verging towards a soft black in color, and the bridge of it should be closely covered with wool that does not show any inclination to peel about the cheeks. The neck should hold the head erect and be stout and short and drop evenly to the shoulder. The back should be flat, firm, and well covered, the loin wide and meaty, and the hindquarter above well covered and coming out square. Below the region of the twist, there should be plump, firm muscle, and on the outside of the thigh, the covering should be thick, giving a full leg of mutton. The hock should be open-angled, dropping straight, and not have the point of it sticking sharply out from the body. The leg should have wool running well down on it, and the pasterns should be stout and strong. In front, the chest should come out full and rounded, and not narrow and sharp. The shoulder on top must be compact and also fit closely to the body on the side. The spring of the rib should be such as to meet the shoulder flush and also give the body a round, circular, and compact appearance that is usually the leading attribute of the easy keeper. In the ewe, the main differences are a refinement of the features of the head — slimmer, longer face, and that delicate expression of femininity which means a high development of maternity. Such usually means

good nursing qualities, free milking powers, and the desire to cater to the comfort of her young. The fore quarter in the ewe is narrower and lighter as a rule and wider in loin and hip in conformity with what is universally known as the female type in animal life. The fleece in both sexes should be compact, clean in condition, fine in quality, and with sufficient length and weight to make the quality of the clip satisfactory. No black fibers are permissible anywhere, and the black hairs of the legs and face should not find their way into the fleece. When open at any point, the cleavage should be clear, and reveal a skin of a light cherry color.

Position as producers of mutton. — The Shropshire is an early maturing sheep, as the lambs are usually so plump and smooth that they are ready for market any time within the year. They reach maturity at an early age, but do not weigh as much as the long-wooled breeds at maturity, nor can they show in daily gain the rapid increase that some others may. Their gain, however, is not that due chiefly to increase in frame, as in the instance of some of the long-wooled breeds, but rather to a combination of increase in both frame and flesh. As it has been expressed, they grow and fatten together, which gives them their characteristic early maturity. In 1890 the best daily gain of the Shropshire lambs at the Smithfield Show, namely, .67 pound per head, was only surpassed among the Down breeds by a

pen of Hampshires. The Shropshire pen averaged 171 pounds at an average age of 254 days. The percentage of carcass to dressed weight in the instance of these lambs was 60.8 per cent. The next year two pens of Shropshire lambs succeeded in each making an average daily gain of .60 pound per head. The one averaged 164 pounds at an average of 270 days, and the other 162 at the same age.

The quality of Shropshire mutton. — Being fine in bone, skin, and fleece, it is logical to assume that the Shropshire produces a fine quality of flesh. In this feature they rank almost with the Southdown, which is considered preëminent in this respect. Not only is the mutton of fine quality, but it is also nice in its mixture of fat and lean. The frame of the Shropshire being of fine texture and comparatively light, together with the fact that they are usually well developed in essential mutton parts, insures a high percentage of edible meat in proportion to the live weight.

Qualities of the Shropshire fleece. — In respect to the quantity of wool that is characteristic of a Shropshire fleece, ten or twelve pounds may be advanced as a fair estimate. The wool being very free from excessive yolk and also clean as a rule, this weight, in view of these facts, is favorable to the breed. The most valuable characteristic of the fleece is its density, which so materially assists in affording the sheep protection from the inclemencies of the weather.

The length of the staple is very satisfactory in the present market, as it grades as a medium combing that brings a higher price and is in a stronger demand than any other grade. The staple is from three to four inches long uniformly over the body. In respect to the quality of the Shropshire fleece, there is considerable variation amongst the representatives of the breed, but not more so than in others, excepting the higher-bred Southdowns. The fleece of the best representative is soft and fine, with a close, even crimp from one end of the fiber to the other. Then this quality is characteristic of all regions of the body, though there are individuals that strongly incline to coarseness of wool about the thigh, neck, and head. The soundness and strength of the Shropshire fiber in association with its combination of length and quality add greatly to its marketable value, as these are important qualities in combing wools. In respect to the condition of the fleece, the Shropshire is in the fore rank. The fleece being dense, dirt and dust do not find ready entrance, and as the wool is naturally bright, it has a high position in regard to purity and brightness. In lustre it is seldom that a Shropshire fleece will show the lustre that is more or less common among the long-wooled breeds. The absence of lustre and the scarcity of yolk are frequently associated, and in both, the fleeces of this breed do not occupy as favorable a position as the other features of condition.

Characteristics as breeding stock. — The leading merit of the Shropshire, in which they contest for supremacy only with the Dorset, is the degree in which they meet the requirements of good breeding stock. The rams are of good disposition, and reliable breeders, but it is to the ewes that we look to sustain the Shropshire's reputation for good breeding qualities. The ewes are excellent mothers, having the disposition to be attentive to their lambs in a kindly way, and also having characteristics of being prolific and milking freely. The average Shropshire flock will return at least a lamb and a half to a ewe, though there are many records of better returns than this. A peculiar and valuable characteristic is the length of time they will retain their utility in the flock. It is not infrequent in the pure-bred flocks to find ewes ten years old still producing as good lambs as the younger members. The presence of such not only indicates excellent vigor, but also points to a good breeding record for each year, as any deviation from this would mean disposal as a cull. As an instance in point, it will be sufficient to quote one from among many: A ewe purchased at a sale of a prominent breeder in Shropshire in 1886 when four years old was alive and well in 1893, and her record in the seven years was the production of fourteen lambs, twins each year, excepting one instance of a single and one of triplets. The ewe was eleven years old at the time the data were

sent in, and was hearty then. In permanency of character, the Shropshire occupies a favorable position, though they have hardly been able to equal the older breeds up to this time.

Utility for crossing. — The Shropshire has proven to be a valuable agent in improving Merino stocks so that they may more perfectly meet the demands of the present market for mutton and wool. The writer experimented with this cross for several years until the stock studied included sheep of the first, second, third, and fourth crosses. The Merino ewes employed in the trial were typical of the American Merino, being fine-fleeced, large, and vigorous, but without any appearance of mutton quality. The Shropshire rams used were typical of the breed. In the first cross, of the Shropshire ram on the Merino ewes, an increase in size and a much smoother appearance of the body resulted from the nearer approach to mutton form. They are heavier than the original Merinos and are especially better in the development of mutton points. The fleece is exceptional in the degree to which it meets the demand of the market for a medium combing wool. The fiber is coarser and longer than the pure Merino, but these qualities in connection with its firmness and strength make the fleece worth more in the market. The weight of the fleece remained about the same. The improvement consisted in weight, mutton form, and feeding qualities. The second

cross, that is, a Shropshire ram on the first-cross ewes, is larger and fuller in mutton points, and the fleece is longer and stronger in fiber, though lighter in weight. The third cross is a still nearer approach to the Shropshire. In fact, they cannot be distinguished from the pure-bred Shropshire, and for the market they are equally profitable. A slightly greater length of fiber, more strength, and coarseness characterizes the wool of this cross, while there is a peculiar softness noticeable in the fleeces with their density add greatly to their value. point noticeable in these trials was the rapidity and certainty with which the Shropshire transmitted their characteristics to the Merino. The Merino is one of the longest established breeds that we have, and consequently quite fixed in its characteristics, yet the Shropshire influence very materially asserted itself in each cross. For crossing on common sheep, the Shropshire has enjoyed unequaled popularity because of the degree to which it is capable of improving the common type for the requirement of our wool and mutton markets.

Adaptability of Shropshire. — Compared with other breeds, a striking feature of the Shropshire is its cosmopolitan nature. As may be seen from our classification of the breeds, and as may be learned from a personal study of its characteristics, the Shropshire occupies a middle position. They are neither small nor large in size, they are medium in

FIG. 24. — Cheviot ram and ewe shown in 1911 by G. W. Parnell, Wingate, Ind. (Page 131.)

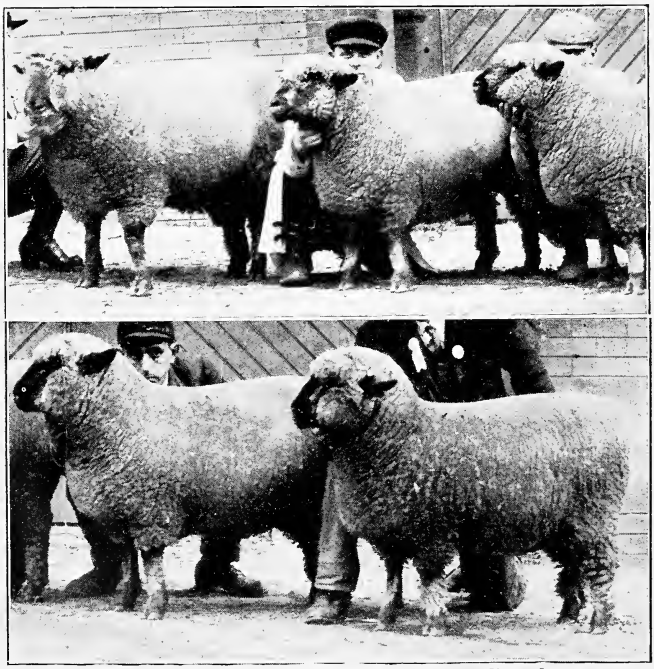


FIG. 25. — The first prize Hampshire flock at the leading shows in 1911. Shown by C. O. Judd, Kent, Ohio. (Page 105.)

PLATE IX. CHEVIOT AND HAMPSHIRE SHEEP.

quality, both in respect to frame and fleece, and in nearly all other characteristics they occupy a similar position. Medium development in many directions makes them sheep of exceptional combinations, and these add to the profit they make, for the markets of to-day demand a finished carcass of medium size. Not only does the Shropshire represent a desirable combination from the market point of view, but they also show a union of many useful qualities from the breeder's standpoint. While not as highly developed in the direction of quick gains in fattening as some breeds, they have become the stronger for it in the qualities that are sought for in brood ewes. Exceptional development in the ability to take on flesh rapidly is somewhat antagonistic to free milking attributes in all animals, and in the nature of the Shropshire the latter leads in importance and profit to the flock.

The Hampshire (Fig. 25, Pl. IX)

In a description of the farming of Hampshire in England, an early writer says that with the exception of an outlying block of land to the northwest (which he estimates at 325 square miles) the mainland of the county of Hampshire approaches in form to the parallelogram, the sides of which face the four cardinal points. The area is 970,470 acres and the number of farms 3048, and most of these are

under 300 acres in extent. The main water-shed line of this county, according to the same writer, begins at Inkpen, Beacon, 972.8 feet above the level of the sea, in the North Downs, and it ends at Butzer Hill, altitude 882.6 feet, in the South Downs. The writer before quoted estimates the central chalk plateau at 760 square miles, while the soil of the rest of the country is made up of clays, marls, sands, and gravels.

The Hampshire foundation stock. — The earliest recorded description of the foundation stock from which the Hampshire was evolved was written by Messrs. Abraham and William Driver for the Board of Agriculture of Great Britain in 1794, in which they say: "The Hampshire sheep is horned for the most part, with a white face, though some few have speckled faces; formerly they were long-legged and narrow, but now much improved, being short-legged and well-carcassed." The sheep of Wilts and Hants, the original source of the Hampshire, is described as follows: "They were imposing-looking animals, long in leg, high in withers, sharp in the spine, large, bony, narrow, with big heads, curling horns, and Roman noses. They died out in Wiltshire about forty years since. They lived rather longer in Hants, their powers of enduring long traveling and severe folding, hard keeping, and working recommending them as the best manure carriers for the light lands, which were by this means alone kept in a state of fertility."

The sources of improvement of Hampshire. — Writing of the sheep of South Wiltshire, or the chalk district, a report of 1844 says: "The principal live stock of this division of the county consists of sheep, for which the nature of the soil and of the farms is peculiarly adapted. Southdowns are nearly universally the breed now, and although the sheep-fold is a paramount object on a South Wilts farm, the quality of the animal is not neglected. As much attention has of late years been paid to the improvement of the breed of sheep in Wiltshire as in any county in England. Many of the flockmasters of Wilts have by judicious selection of stock from Sussex (the home of the Southdown) brought the flocks to a high state of perfection, and their stock being dispersed throughout the county, has greatly improved the breed of sheep. There are a few who prefer the Hampshire or coarser kinds of sheep; and whether the forcing of lambs from their birth to be fat in the autumn or for grazing as tegs is adopted, it appears well, as the extraordinary production of that breed brought to the fairs within the last few years will prove; but the generality of farms are stocked with Southdowns." A more detailed account of the sources of improvement comes from the pen of John Wilkison, who says: "In the beginning of the century rams were procured from the best Sussex downs, less picturesque, but more symmetrical; faces and legs dark brown, fore quarters

wide and deep, back and loins broad, ribs curved, back level, hind quarters square, tail well set on, limbs short, bone fine, wool close and firm, features intelligent, forehead prominent and carrying a good crest." The same writer is the only authority that may be quoted in support of the statement that the Cotswold has also been used in crossing on the original Hampshire. Continuing, he says: "But the existing breed has been further mixed. It is not everywhere a simple cross between the old Hampshires and the Sussex. Some thirty years or more since, Mr. John Twynam (now residing in Winchester) put Cotswold rams to his Hampshire Down ewes." Another source of improvement in the Hampshire was the better care in feeding that was given them. Instead of being regarded as "manure carriers for light land," they had given them an unusual variety of the best foods in liberal quantities. This is a distinctive feature of the Hampshire management at the time, and it has existed so for years. As early as 1861, John Wilkison, writing of the usual care given to the feeding of the lambs, says, "They never see an empty trough from their birth to their death." As to the management that assisted greatly in the improvement of this breed of sheep, a modern writer describes it in detail as follows: "Ewes are given one pound of cake per head daily with turnips and hay. As soon as the lambs will eat they are given a corner to themselves

where they are fed finely ground linseed cake, split peas, oats, and crushed malt. The lamb hurdle is from this time an institution. By its means they run forward and cup the first green food of the season in the form of swede tops or rape. They are getting at this time eight different kinds of food, hay turnips, greens or rape, linseed cake, peas, oats, salt, and milk." "Take, for example, a fine mid-summer day when the lambs awaken from a fold of vetches. The shepherd is up betimes and begins by giving them an allowance of cake. He then grinds some mangel into the trough, which they eat with great relish. They are next admitted to a fresh fold of vetches, after which they are quietly walked away to a neighboring fold of good rape or cabbage. After two hours or more and in the heart of the afternoon, they are allowed to spread themselves over some old aftermath clover, after which they return to the vetch field, and after receiving another feed of corn they lie down to well-earned repose, having increased their weight over one pound each. Hay chaff is frequently supplied even in summer by way of keeping them firm in their bowels; thus a lamb may easily partake of six or eight pounds of food. Rape or cabbage or kale give way to turnips in late July or early August, and the allowance of corn is kept up from one pound to one and one half pounds per head. This allowance is pretty constant from birth, considering the cake given the

ewes, which is, of course, given for the benefit of the lambs."

These accounts make it evident that cross-breeding was the first source of improvement, while the second and most influential source was the high feeding and culture that followed the breeding operations.

Extent of the Hampshire improvement. — In a prize essay written in 1847, Robert Smith says: "The Hampshire Downs were originally very large and coarse, but of late years they have been improved by an admixture of the Sussex Down; still, however, they retain an extra degree of size, bone, and fleece to any other, and are easily distinguished by those characteristics. Breeders who prefer strong sheep consider this variety better than any other for enduring hardships and for general purposes." Writing a few years later, 1855, another authority states: "This rapidly increasing breed of sheep appears to be the result of a recent cross between the pure Southdown and the old horned white-face sheep of Hampshire and Wiltshire, by which the hard-working though fine quality of the former is combined with the superior size and constitution of the latter. The breed was commenced at the early part of the present century and, by a judicious crossing, now possesses the leading characteristics of the two parent breeds. Their leading characteristics, as compared with the Southdowns, are increased size, equal maturity, and a hardier constitution." A few years

later, 1861, Mr. John Wilkinson gives his opinion on the influence of the cross: "A judicious system of crossing preserved the good qualities of both breeds. The hard-working qualities and hardy constitution and the superior size of the one have been combined with the smooth limbs, short legs, broader back, rounder barrel, more compact frame, increased flesh, and kinder qualities of the other. The horns have disappeared, the color of the face has turned from white to brown, and there is generally more of the Sussex than of the Hampshire Down left. Still, even in appearance the new Hampshire assert their descent from the old Hampshire mothers. They are larger than the Sussex Downs, and more roomy, generally coarser, and of a heavier frame. Their wool is of a large staple and coarser, not so close, and not curling with spiral ends. But however extensively crossed before, the Hampshire blood is now generally kept pure, though there are not wanting, here and there, signs of degeneracy, sheep with tendencies to hairy wool, big bones and heads, and indications of the coarse and unthrifty ewe from which they came." The Hampshire has been shown at the Royal Society Show as early as 1844, but the first description of an exhibit was made in 1862, when the subjoined comment was made on those exhibited at the Royal Agricultural Society Show: "The Hampshire Down sheep presented in their various classes the usual difference

of type between the original best County Down sheep with its large form and strong constitution and the 'improved Hampshire Down' with its more symmetrical form, better flesh, and finer wool. In each type their tendency to early maturity, which has given this breed of sheep their high character, has been properly preserved, and this is evidently a great point with the breeders. In the shearling rams great size and, in most instances, excellent quality of flesh and wool are found; but the acceptance of a black face as a type of the breed has led, in many instances, to a tendency to rustiness if not blackness of the wool around the ears and poll. We regard this as a great defect, which in common with occasional thickness in the neck or scrag exhibits itself in some cases throughout all the classes." The next year the report of the Stewards of the show was to the following effect: "The last-named gentlemen [Mr. W. Humphrey and Mr. James Rawlence] were the first who set to work in good earnest to improve the old Hampshire breed, which originally was celebrated for its big head, long ears, and thin-fleshed back. In neither class, referring to the shearlings and the older sheep, were the enormous heads and upright shoulders to be found which formerly prevailed so much among the Hampshire sheep; all were level in their character, form, and wool, and, in fact, with such general uniformity that they might all have come from the same flock." These improve-

ments have come about largely by crossing and selection assisted also by high feeding, but the chief benefit that has followed the latter features has been the development of early maturity. A breeder has summed this characteristic in the following words: "Their principal points of excellence lie in their extraordinary early maturity coupled with a yield of mutton of splendid flavor and quality and with an abundance of fleece of finely fibered wool. As to the first point, they are unrivaled and might safely be pitted against any other sheep at heavy odds and with heavy stakes and would then undoubtedly prove winners. A sheep that will increase these qualities every day from birth to maturity, and weigh ninety pound carcass or dead weight at twenty-six weeks old, may be regarded with some surprise, and yet this result has been excelled by breeders of the improved Hampshire Down. I have had lambs increase .81 pound per day for the first half of their lives, an increase which compares very favorably with the .67 pound recorded from the Lincolns or the .52 pound recorded by the Southdowns." It was in 1887 that the American Hampshire Down Breeders' Association was formed, and in 1890 the first volume of their flock book was issued. The breed has long before this attained the fixity type and characteristics necessary to receive registration as a breed.

Characteristics of Hampshire. — The standard of

excellence and scale of points adopted by the American Hampshire Down Association are as follows: Head moderately large but not coarse, well covered with wool on forehead and cheeks; nostrils wide; color (head and legs) dark brown or black; eyes prominent and lustrous; ears moderately long and thin and dark brown or black in color; legs well under outside of body, straight with good size of bone, black; neck a regular taper from shoulders to head without any hollow in front of shoulders, set high up on body; shoulders deep and full in heart place, with breast prominent and full; back straight, with full spring of rib; loin wide and straight without depression in front of hips; quarters long from hips to rump without sloping, and deep in thigh, broad in hips and rump, with full hams, inside of thighs full.

Mutton qualities. — While the Hampshires are not the finest in the quality of frame or flesh, they have the reputation of surpassing all others in the rapid gain the lambs make when well fed. At the Smithfield fat stock show in England, they have in the majority of instances led all others in the rate of daily gain. In 1882 the pen of Hampshires averaged .75 pound per head daily, which was only equaled by the pen of Leicesters; in 1883 two of the Hampshire pens averaged .77 pound, which led all others, and in 1885 they again led with a daily gain of .76 pound, and in 1886 they were tied for first position with the Lincolns,

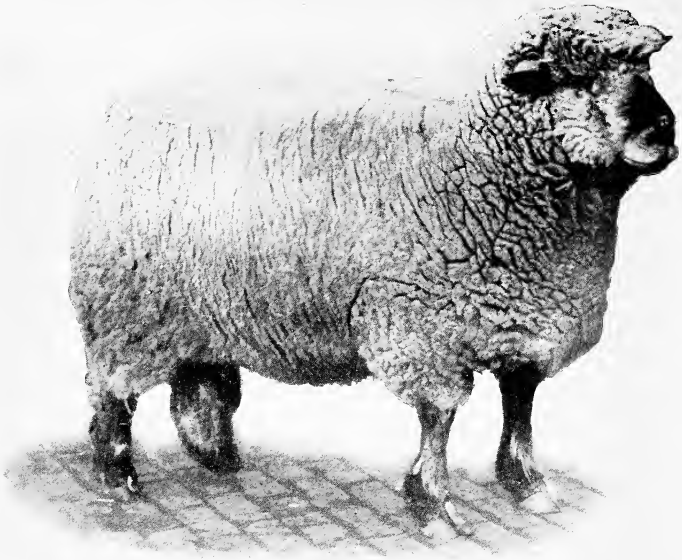


FIG. 26. — Champion Oxford ram at the International Live Stock Exposition in 1911. Shown by George McKerrow and Sons, Pewaukee, Wis. (Page 117.)

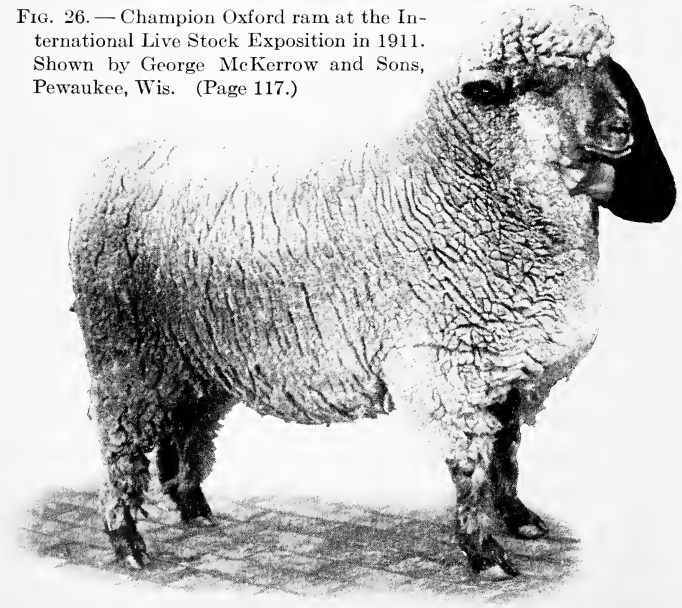


FIG. 27. — Champion Oxford ewe at International Live Stock Exposition in 1911. Shown by George McKerrow and Sons. (Page 117.)

PLATE X. OXFORD DOWN SHEEP

as both had representative pens that made .76 pound per head daily. Their record begins again in 1889, when the best pen of Hampshire lambs made an average daily gain of .67 pound, averaging 187 pounds live weight at an average age of 277 days. In 1891 the best gain made by Hampshires in the lamb class was .70 by a pen averaging 220 pounds at an average age of 314 days. In 1892 the best gain among the Hampshire lambs was .73 pound, made by a pen averaging 220 pounds at an average age of 314 days. These lambs in the slaughter test returned a percentage of 57.73 of carcass to live weight. In 1894 the best gain in the Hampshire lamb classes was .71 pound, made by a pen averaging 218 pounds at an average age of 307 days. The lambs in the slaughter test yielded a percentage of 64.68. In the yearling class, the greatest daily gain was .42, made by two pens, each averaging 660 days old and weighing an average of 280 pounds and 282 pounds. One of these pens dressed 65.84 in the slaughter test. This year the highest rate of gain was .82 pound per head daily, they averaging 246 pounds at an average age of 300 days. While the Hampshires have made a good record, yet at the later shows they have not been able to maintain their previous position, as the long-wooled breeds, especially the Cotswold, have been surpassing them in this single feature of rate of gain. In rate of daily increase, it is likely that the Hampshires surpass the

rest of the Down breeds, but they are inferior to the latter in quality of frame and flesh. The Hampshires are inclined to be coarse in bone, coarse in texture of skin, and also in fleeces, all of which are opposed to fine quality of mutton.

Characteristics of Hampshire fleece. — The fleece of the Hampshire, while possessing the quality of density, is usually light, as eight pounds would be an average return in unwashed wool from a flock. The wool is coarse, as a rule, and frequently discolored. Some districts in their native home have for a soil a red clay which discolors the wool and renders the fleece less valuable. The fleece covers the body, as it does not peel much from the head or from the belly. As a rule, the fleece is moist, indicating a healthy and satisfactory condition in respect to the quantity of yolk present. The wool is of medium length, being about three inches long.

Attributes for breeding purposes. — The Hampshire is equally prolific with the other Down breeds. It has been advanced against the breed that the lambs make trouble in lambing, owing to the size and shape of the head. It is certain that one of the characteristics of the breed is to drop very heavy and vigorous lambs. One instance has been registered of a Hampshire lamb weighing eighteen pounds at birth. Ordinary lambs will only weigh one half of this. The ewes and the rams are exceptional in constitution. For crossing purposes, the Hampshire

has found favor when early lambs find a profitable market, for the lambs of this breeding weigh heavier at an early age. On ewes that have an abundance of quality, the Hampshire would make a good cross for the purpose of producing lambs to meet the wants of the early market.

Adaptability of Hampshire. — Under conditions where the food is abundant and the forced system of breeding may be followed, the Hampshire will give returns in gain equal to the long-wooled breeds, while they may be said to be able to withstand inclemencies of the weather to better advantage, as their fleeces are closer and they are naturally more vigorous. For folding on green crops, rape, vetches, or turnips, with heavy grain feeding in addition, there is no breed among the Downs that will give returns equal to the Hampshire, and where this system of management may be adopted, and the market is not too sensitive in regard to the quality, the Hampshire will prove as profitable as any breed.

The Oxford Down (Pl. X)

The Oxford Down has originated from crossing Cotswold rams on Hampshire and Southdown ewes. One of the first breeders writes: "The Oxfordshire Down breed of sheep is the result of a cross between a long-wooled ram and a Southdown or Hampshire Down ewe. The crossing was commenced as far

back as 1830. Mr. Twyman claims to be the pioneer in this movement. Be this as it may, he may safely assert that he was the first to call public attention to his mode of crossing. As far back as November 27, 1837, this worthy and enterprising gentleman wrote the *Mark Lane Express.* 'It is seven years since I introduced an upland Cotswold ram among a few Hampshire Down ewes, the produce of which, living with the Downs, soon convinced me of their superiority.'" Contemporaries of Mr. Twyman were Mr. Samuel Dreuce of Eynsham, Mr. W. Gillett of Southleigh, Mr. Blake of Stanton Harcourt, Mr. Hitchman of Little Milton, and Mr. Joseph Waterpeny. Mr. Dreuce, in an article in the Royal Agricultural Society Journal of 1853, page 212, observed: "It is now twenty years since I began crossing between the Southdown and Cotswold sheep, and with the ordinary skill of sheep-farming, I find no difficulty in keeping the form and the size of the animal as it should be." The writer before referred to, Mr. Howard, was one of the oldest living breeders of Oxfordshire Downs, he having been a prize winner at Smithfield as early as 1849.

Formation of Oxford Down as a breed. — An early authority gives the following account of the progress made in the formation of this breed at that time: "The produce of good and well-selected cross-bred ewes and rams are now more uniform in color and size than sheep bred from Down mothers and Cots-

wold sires. There formerly existed much difficulty in keeping a newly formed half-bred flock to one character. The first cross and their produce will be dissimilar; some will partake too much of the long wool, while others are too small and short-coated. The owner formerly divided his flock into three parts, putting a half-bred ram to the ewes that were about right, a Cotswold to the smaller ones, and a Down to the coarser sheep. By constant attention to these points, a flock may be brought to some degree of uniformity; but the breeder frequently found that the fleece was a little too short or the face rather too white; by using pure Cotswold or Down rams, he rushed into the other extreme, the produce too much resembling their sires. There is now no need of running back to the pure breeds, as there are numerous Down-Cotswold rams to be found varying in size, color, and wool, according to the fancy of the breeder, which will meet the deficiencies of any half-bred flock." In the same report, this author continues: "The Down Cotswold sheep of this country were originally a cross between the Cotswold ram and the Hampshire Down ewe, but the cross having been bred from nearly twenty years without the infusion of any fresh blood has become a distinct breed."

Qualities desired by breeders of Oxford Downs. — The aim of the early breeders seemed to be to produce a sheep with the weight of a long-wooled representa-

tive, and the quality of a Down. As Clare Sewell Read expressed it, the breeders sought an improvement of the Cotswold at that time because their meat gave too much to the grease pot and too little to the table, the mutton at that day selling for a penny less per pound than that of the Downs.

The same writer faulted the Downs for the conditions of Oxfordshire, because they are not adapted for folding, as he says: "In feeding these two sort of sheep on dirty land, the Downs with short coats do not keep themselves as clean as the half-breeds. The Down is constantly moving about and will amble round a turnip and walk about his fold, while his less active neighbor will eat his feed and quietly lie down." It will be seen that the object of the breeders was to produce a sheep adapted to the arable farming conditions of Oxfordshire — a sheep that would stand folding and heavy feeding and yet retain some of the quality of meat and wool and hardihood characteristic of the more active Down breeds.

Recognition as a breed. — The Royal Agricultural Society, formed in 1838, held its first exhibition at Oxford, 1839, and in the first report of the society the only breeds recognized are the Leicester and the Southdown, there being another class called "long-wooled," in which Cotswold and Oxfordshires were shown. The latter were then considered long-wooled, and in this class at the exhibition mentioned, their premiums were awarded to Oxfordshire rams

and ewes. They were shown year after year in this class, but the desire of the breeders seemed to be to get a place among the short-wooled class, and finally in 1861 the attempt was made to show these in the class for "short-wooled" sheep not Southdown or Shropshire. The judges, however, excluded them from competition in this class, but the sheep were commended so, that in December, 1861, the Royal Agriculture Society Council gave them a class, and they assumed the status of a breed.

Characteristics of Oxfords. — The scale of points adopted by the American Oxford Down Record Association is as follows: —

Breed type of animals. — Form of a good general appearance, made by a well-balanced conformation, free from coarseness in any part, and showing good style both at rest and in motion 15

Head of moderate length and width between the ears and between the eyes, and well covered with wool over poll and down to the eyes. Color of the face an even dark gray or brown, either with or without gray spot on tip of nose. 6

When fully matured and in good condition rams should weigh 250 to 350 pounds, ewes, 180 to 275 pounds . 5

Ears medium size, not too thick and of even brown or dark gray color 2

Legs short, strong in bone, flat and of even dark gray or brown color, placed squarely under the body and well apart 2

Constitution. — Large around the heart and wide and full in the chest 10

Movement must be bold and vigorous	5
Eyes bold, prominent, and bright	4
Skin bright pink in color	3
Neck strong and muscular in rams and well set on in both sexes	3
Mutton form and quality. — Wide and straight on shoulders, back, loin, and rump, from base of neck to tail	15
Full shoulders and thighs, well meated both inside and outside	5
Flanks well filled and strong so as to make the lower lines of the body as straight as possible, and the side lines straight and rather full	4
The whole carcass evenly covered with well-marbled meat	6
Wool. — Fleece of moderate length, close, and of even quality, covering the whole carcass well, and free from black patches upon the body, neck, or head	15

Mutton qualities. — The Oxford Down is the heaviest of any of the Down breeds at maturity, and is also larger in size. At the Smithfield show, they have made an excellent record in showing capacity to make rapid gains when fed for show purposes. In 1884 at this show, the pen of Oxford lambs reserved for the breed cup made .78 pound per head daily gain, which was the highest up to that time. In 1885 the first prize pen of lambs averaged .75 pound per head daily gain, which was also unusually high. The pen of lambs shown in 1887 averaged 277 days old and weighed an average of 192 pounds, or an average gain of .69 pound. In 1890 two pens of lambs each made an average of .65 pound per

head daily, the one pen being an average of 193 pounds at 291 days old, and the other 197 at 300 days old. In 1891 the Oxfordshire won the championship of the short-wooled classes, and the same pen won the breed cup. They averaged 314 days old, weight 216 pounds, daily gain per head .68 pound. In the lamb classes of 1892, the best pen of Oxfords made a daily gain of .67 pound as they averaged 314 days old and weighed an average of 211 pounds. This pen was in reserve for the championship for short-wooled classes. In the slaughter test, they dressed the unusually high percentage of 67.05. In the yearling class the same year, the best gain reported was .43 pound by a pen weighing an average of 289 pounds at an average of 667 days. In 1893 the best gain recorded among the lamb classes was .67, made by a pen averaging 215 pounds in weight at an average age of 314 days. The following year, 1894, the daily gain per head reached .68 in the instance of the Oxford lambs, as they weighed an average of 180 pounds at 263 days old.

From these records it is evident that the Oxford is a good feeding sheep, having the ability of the long-wooled breeds to attain heavy weights and yet retain much of the quality of frame so characteristic of the other Downs.

Fleece characteristics of Oxford Down.—The Oxford yields the heaviest fleece of wool of any of the Down breeds. From 10 to 12 pounds unwashed wool

would fairly represent the average of most flocks, though 15 pounds is a common weight to be reached by individuals. The wool is 4 to 5 inches long and comparatively fine in fiber for the length. There is probably more variation in the fineness of the fiber in Oxford Down fleeces than in any other breed, the wool of some representatives being remarkably fine in fiber, while others are nearly as coarse as some of the long-wooled breeds. The fleece is much denser and more compact than any of the long-wooled representatives, as it is very similar to that of the other Downs in that point.

Breeding qualities. — The Oxford are prolific and the ewes are good nurses. A lamb and a half as an average from each ewe in the flock is not uncommon, and this is good testimony not only to the prolificacy of the breed, but also offers good evidence of the qualities of the ewes as mothers. One of the leading agricultural societies of the country has offered prizes to the shepherd who shall rear up to the first of May the greatest number of lambs from the ewes put to the ram. In 1886 the winner reared 198 lambs from 130 ewes, slightly better than one and one half lambs from each ewe in the flock previous to September. The next year in the same flock, 132 ewes gave a return of 213 lambs reared by the first of May. There are other instances of larger returns than this from smaller flocks, but those referred to are satisfactory evidence of prolificacy and good

nursing qualities of the Oxfords. As a rule, the Oxfords are reliable breeders, though there is perhaps more variation in the results of the mating than is desirable. The breed is growing more permanent in character and type, and as they become more strongly developed, greater certainty in the reproduction of their qualities will result.

Adaptability of Oxford Down. — Being a large sheep, the Oxford must necessarily have good fare, and that implies abundant pasturage with the arable land to grow the fodder and grain crops that are necessary for making heavy weights. The Oxford is of rugged constitution and able to withstand exposure, but it does not possess the activity and disposition required of good foraging sheep.

The Suffolk

The home of the Suffolk is in southeastern England, chiefly in the shires of Norfolk, Suffolk, and Essex. The land upon which and for which the breed has been developed is somewhat elevated and exposed to dry easterly winds. The grasses are referred to by Low as hard and wiry and the sheep as having to traverse larger areas in grazing than in other sheep-raising areas. The native type evolved before systematic improvement began was known as the old Norfolk breed. They were long-bodied and muscular, long in limb, and carried their heads

erect. They were very black in coloring of face and legs, and both sexes were horned.

With the improvement in agriculture, the flocks in this section felt the influence of the Southdown. In 1847 it was stated, "Breeding sheep are chiefly a cross between the Down and old Norfolk." Other breeds were used, but the Southdown is responsible for such of the improvement as can be attributed to outside blood. For some years the stock was known as Southdown-Norfolk. In 1859 classes were given them at the Norfolk Agricultural Association's meeting, and they were named Suffolks. In 1867 the Royal Agricultural Society offered special prizes for the breed, and since 1880 it has been included in the classifications of the shows of the Royal Agricultural Society and the Smithfield Club. In recent years the breed has won a creditable record in the slaughter tests at Smithfield.

In size, the Suffolk is larger than the Shropshire, though smaller than the Hampshire. Its striking characteristics are its dark black face with no wool forward of the poll and the bare black legs. It frequently stands rather high, an appearance sometimes accentuated by shortness of belly wool. While holding a firm place in the intensive agriculture of its native counties, it has not obtained a very wide popularity in America. This may be partly because it does not represent such a combination of wool and mutton as is found in other Down breeds. The

lambs are usually black at birth, and the crop sometimes amounts to one hundred and fifty per cent. The ewes are particularly heavy milkers.

The Dorset Horn (Fig. 28, p. 131)

The horned feature of Dorset rams and ewes suggests the thought of their having descended from the same original stock as the Merino. Though there are few horned breeds of British sheep, the unimproved stock was commonly horned, as shown in the discussions of the other breeds. That the Dorset is mainly distinct from other British breeds is shown by the fact that it was the only white-faced British breed with horns. The stock from which the present breed was derived seems to have been native from very early times to south and part of central England, particularly the counties of Somerset and Dorset. In relation to their origin, Marshall, writing in the eighteenth century, mentions the fact of a race of sheep inhabiting a great part of Devonshire, some of which were horned. He also remarked that in the different varieties of the breed there were certain individuals that have so strong a resemblance to the present breed of Dorsetshire as to leave little doubt of their having a natural alliance and, as bearing out this theory, he alludes to the fact of the Dorsetshire or "house lamb" breed being found in great purity in the vale of Exeter and that one flock of

this description that he found in a state of neglect was fast reverting to the breed of the country.

This type of sheep in its native section seems to have always been noted for its fecundity, which is characteristic to-day as their distinguishing utilitarian point. The active improvement of the Dorset came somewhat later than that of the Leicester and the Southdown; although rams of these breeds were considerably used in Somerset and Dorset, their use was mainly for producing market stock and the breed of to-day shows no evidences of indebtedness to other breeds.

"In the first quarter of the nineteenth century, when the higher price of Southdown wool induced many flockmasters to keep that breed instead of the native Dorset sheep, the breeders in West Dorset, claiming faith in their Dorset sheep as the breeds most suited for their locality, instead of giving them up, set to work to improve them by selection of the type desired, and at the same time to retain all their good qualities. In this they were successful, the dark color on the noses disappeared, the horns ceased in great measure to grow upwards and backwards, and as a rule curled round by the side of the face, without rising above the head or inclining backwards. Their fore quarters became heavier and thicker through, the good qualities of both mutton and wool were present, as well as those noted characteristics of fecundity, hardiness, and early maturity."[1]

[1] Dorset Horn Sheep Breeders' Association Flock Book, Vol. I.

The first occasion on which separate classes were provided by the Royal Agricultural Society for Dorset sheep appears to have been at the Battersea meeting in 1862, when the judges reported that "the competition in these classes was very limited, but the animals exhibited were a very superior quality and represented admirably the character and excellence of the breed." They were next exhibited in 1865 at Plymouth.[1] Sheep of Somerset and Dorset were classed together as late as 1890.

The following, written in 1892 for the first volume of the Dorset Horn Flock Book, gives an insight into the intensive sheep-farming of England:—

"The general management of the breed in Dorset is as follows: About one to one and one half ewes are kept to the acre, according to the quality of the land and the amount of water, meadow, and pasture attached to it. They require plenty of room and are generally allowed to roam the pasture in the daytime, being brought to the arable land at night. They take the ram fully two months earlier than any other breed and the general lambing time for the flock ewes is about Christmas and up to the middle of January. The off-going ewes are sold in lamb in the months of September and October and drop their lambs in October and November, the lambs being fattened for the London market. The flock ewes generally lamb down on the grass; they are

[1] Dorset Horn Flock Book, Vol. I.

then sent on to roots, the lambs being allowed to run forward. The lambs remain with the ewes till some time in May, when they are weaned and then go on to good sound grass till the fodder crops — rye, vetches, or trifolium — are fit to feed. They remain on vetches till about the end of June. As most of the lambs are fattened, they receive as much cake and corn as they will eat, the object being to fat them off as quickly as possible. They receive about one fourth pound to one half pound of cake or corn per head per day, with, generally, some peas. With such keep they would in a good season be fit to turn off about the first week in April. The lambs born in October and November receive good feeding and are generally ready for the butcher when from ten to twelve weeks old, when they average from ten to fourteen pounds a quarter and go to the London market."

The breed of to-day is distinguished by the total absence of black markings and by the horns in both sexes. The best individuals are of the same mutton conformation found in other breeds. The most common objectionable features are found in the shoulders and chests. The wool is shorter than in most of the Down breeds, though usually the fleece is quite dense and compact and the fiber averages well in fineness. There is a tendency to lightness of wooling on the belly, that gives an undue appearance of lacking depth of body. The rate of increase is a valuable character, running as high as one hundred

and eighty per cent of the number of ewes. It is the early lambing propensity that gives the Dorset its greatest popularity. Two lambings per year are possible in most instances. It is sometimes recommended that the fall-dropped lambs be sired by Down rams and all marketed, and the spring crop be pure bred for

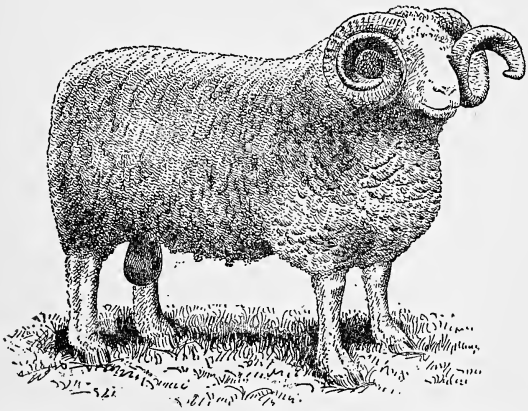


Fig. 28. — A Dorset ram shown in 1911 by Nash Bros., Tipton, Ind.

sale or replenishing the flock. Many of the friends of the breed, however, advise that continued twice-a-year breeding impairs the real value of the flock. The value of lambs ready for market in early winter makes their production an attractive business to flock masters who have the skill necessary to raise them and suitable marketing facilities. The Dorset ewe has a pronounced propensity to come in season and get in lamb at a much earlier date than is common to the other breeds.

The Cheviot (Fig. 24, Pl. IX)

The conditions for which the Cheviot breed has been developed are such as to render it adapted to sections much different from those described for the breeds already discussed. The Cheviot Hills, from which the breed derives its name, are a range of beautiful conical mountains, lying mainly in Northumberland County, England, and Roxbury County, Scotland. Only one of the summits is higher than 2000 feet, so, while the breed is at home in a broken and uneven country, it cannot be called, in the true sense, a mountain breed. The vegetation of the area is varied and often extends to the top of the mountains. The crops produced on the lower parts are used in wintering the flocks. Sheep are the main product and reliance, and more are reared than can be prepared for market at home. There is a wide trade in stock to go to richer farming sections for fattening. "Cast" ewes, or five-years-olds, are commonly sold into the feeding sections to be bred to rams of other breeds and be prepared for market at about the same time as their lambs.

The stock from which the Cheviot was developed has existed in the section for as long a time as is covered by the records of British agricultural affairs. As this country was the meeting ground of the contending and marauding border chieftains, the sheep were little improved and imperfectly cared for until more

peaceful days in the latter part of the eighteenth century. There is record of use of rams of Lincolnshire for improving the form and fattening qualities. The wool-bearing qualities were the subject of attention in 1790 and the following years. It was at this time that their present name came into use, having previously been "long sheep," and such they were by contrast with the short appearing bodies of the black-faced sheep in adjoining territory. The improvement by breeding mainly from within the stock itself gave them a wide popularity, that was curtailed somewhat by a severe storm in 1860 that demonstrated that the heath sheep were better able to withstand extreme hardship in the most exposed sections.

The type of body aimed at by breeders of Cheviots is the same as desired in other breeds, and in the range of weights it is comparable to the Shropshire. Some very strong backs and heavy twists are found as well as tendencies to light fronts and sharp shoulders. The distinguishing characteristics are the shape and expression of the head, the general contour as contributed to largely by the fleece, and the temperament. The head is short and broad, the nose strong, and the eyes usually prominent. It is always white, except for black nostrils, and covered with short, hard hair. The long wool coming up to the line of the ears, which are pointed and active, helps to give an appearance that is unusually attractive.

The fleece is of true middle wool type, but of longer

staple than in most of the Down breeds, which length and compactness upon a rather close-made body gives a distinctive appearance. In temperament, as might be judged from the appearance of the head and residence in the native hills, the sheep is lively and quick, well adapted to an uneven country.

The mutton- and wool-bearing qualities and the uniqueness of its appearance have brought the sheep to many American farms in which the topography is in no way comparable to the Cheviot Hills.

The Black-Faced Highland

This breed has won and held the preference of the sheep-raisers in the higher and more rugged lands of Scotland, beyond the habitat of the Cheviot. It is sometimes called the Black-Faced Heath breed, as expressing its adaptability to the heath country of sparser and coarser vegetation. It was also known as the "short" breed in contrast to the "long" or Cheviot breed. The original stock appears to have entered from England about 1780, but as to its blood lines prior to that time, nothing definite is recorded. It has been brought to a high state of perfection by careful breeding. Comparatively few are fattened upon the farms where bred, being sold into the richer farming sections for that purpose. Their distinguishing features are their short bodies, long, coarse, and sometimes hairy fleeces, and the black or broken colored horned heads. The fleece is of the long-wool type.

FIG. 29. — Feeling the fullness of the neck. (Page 141.)

FIG. 30. — With one hand on top and the other below, estimate the depth of the chest. (Page 141.)

PLATE XI. JUDGING SHEEP.

CHAPTER V

FORMATION OF A FLOCK

It is seldom advisable for the beginner in any kind of stock-breeding to begin with the expectation of offering the increase of the herd or flock for sale as breeding animals.

There are many considerations in preparing stock for sale and in finding buyers that the novice can best leave until he has become experienced in breeding and feeding the class of stock he has chosen. This idea is even more applicable to sheep than to other classes of farm stock.

Pure-breds versus *grades for foundation stock.* — One who is not accustomed to caring for sheep is unlikely to produce many animals in the first few years of the enterprise that will command an encouraging figure as breeding stock. The popularity of a pure-bred flock must always rest upon the ability of its individuals to impart qualities of economic value to stock that is handled for the direct production of meat or wool. In order to establish in his flock the necessary qualities of actual commercial utility, the breeder cannot afford to miss the aid and direction to be secured through selling wool and mutton of the first surplus stock in the regular market.

If guided by what may be so learned of commercial requirements and what is revealed of the difference in value and cost of the product of individual members of the flock, the best possible foundation is assured. Should the pure-bred business seem attractive at a later time, it may be entered in a very favorable way. This, however, assumes that the initial stock was pure bred and that the stock retained for breeders has been kept registered.

If one is unwilling at the outset to risk investing the amount necessary to procure pure-bred stock, equally valuable experience may be obtained with high-grade females and pure-bred males. Such stock may also furnish a good foundation for a flock that it is intended to maintain for commercial purposes only. In any case, the main point to be considered is the actual individual merit of the animals themselves rather than the fact of their eligibility to registration.

A novice cannot afford to expend his time and study and bestow his crops upon animals that are not bred to respond to skillful care and feeding. Individually, good sheep are much more likely to be found in pure-bred flocks than in grade flocks, but they may be secured from the latter. If so, and they have a sufficient number of crosses in them to guarantee the transmission of their excellence, they are good property. If such were procured by a person who should decide in a few years to handle pure-

breds, he would be under the necessity of purchasing new stock upon which to found the pure-bred flock.

Numbers are wholly subordinate to merit in the initial stock. On an average-sized farm where other stock is kept, a dozen ewes or even half a dozen will prove satisfactory as the start for a flock. A larger number has the advantage with some persons of insuring interest and the devotion of time and care that might not be afforded a smaller and seemingly less significant number. If a larger number of the right kind can be secured, it is well to do so, but there can be no true business economy in sacrificing merit to get numbers.

Selecting foundation stock. — In considering that sheep are to be kept upon the farm, it is assumed that the place they are to occupy has been decided upon. While sheep have a value as gleaners and scavengers, the keeping of them cannot be profitable unless they are so cared for as to permit the exercise of their peculiar advantage in economy of production. The keeping of sheep having been decided upon, the matter next in order and coming before the choice of a breed is the plan of handling. The kind of pasture, the extent of use of forage crops, the age to market, are all matters that need to be settled for the home conditions and market before coming to a decision as to the kind of sheep likely to prove most satisfactory.

The Merino types and the Rambouillet have advantages over the British breeds in special resistance to the effects of close herding and in being somewhat less susceptible to injury from internal parasites. The fine wool at times commands high prices. They adapt themselves to a wide variety of soil conditions. Wool is a staple product and easily and safely held.

Depending solely upon wool to repay expense of keeping and furnish revenue from land is a safe venture in few if any parts of the United States. Some breeders will doubtless continue to raise the heavy-folded and light-bodied types for use in breeding for more commercial types, but economical farm practice must place some reliance on the mutton value of the increase and old breeding-stock. If wool is to be made the first consideration and mutton a secondary one, profitable types can be found in the Delaine and Rambouillet breeds.

Where meat-production is paramount, the choice lies between the British long-wool and middle-wool groups of breeds. The former come to market conditions at rather heavier weights than are most popular in the meat trade. The long-wool breeds grow rapidly and, when grown, fatten easily. Their wool is in special demand in some years, and their long breeding under the conditions described gives them inherent qualities that adapt them to corresponding conditions elsewhere.

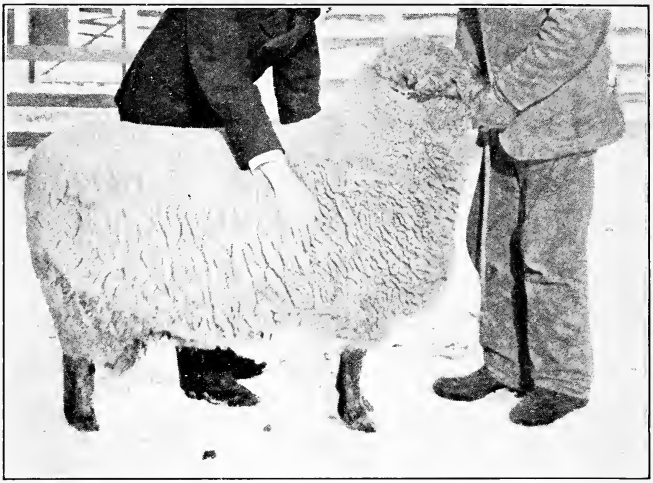


FIG. 31. — Notice the heart girth by the width between the hands.

FIG. 32. — With the hand perfectly flat note the levelness of the back, its firmness and covering. (Pages 141, 142.)

PLATE XII. JUDGING SHEEP.

The middle-wool breeds are so numerous and spring from such a variety of conditions and systems of handling that for any farm that is not so low as to limit the choice to the long-wools, there can be found a breed already improved and adapted to its peculiarities. It is a mistake to expect good results from sheep of any breed when placed in an environment materially different from that of the native home of the breed or expect them to mature earlier or later or at different weights than were common to their ancestors.

Breed type. — It is not points of conformation that adapt a sheep of a particular breed to specific conditions, though size alone may indicate rate of growth and maturity. All the mutton breeds have been bred according to the same general standard; some breeds approach the ideal more uniformly and more closely than others. In the breeds that are less uniformly close to the mutton ideal, there is always some feature of ability to respond to certain conditions and methods of handling that makes them most economical in the sections in which they have been developed. While breeding for a valuable carcass and adaptability, the improvers of the breeds retained the features of general form, shape of head, character of ear, facial coloring and wooling of face or the absence of it, largely as they were found in the original stock with which the improvement began. These distinguishing features have received

the attention of the breeders along with form, fleece, and feeding capacity. They serve to give uniformity in the appearance of the flock and to set it apart from other breeds. The latter purpose is analogous to a "trade-mark." The possession of the special breed points is a guarantee that the animal comes from stock the breeding of which has been directed by the leading men connected with the breed. Breed type, therefore, aside from its own secondary value, argues for the animal exhibiting it, the possession of those inherent habits and special qualities that give the breed its special field of usefulness. The foregoing explains the breeder's great appreciation of type, an attitude which the novice is sometimes inclined to consider as a matter more of fancy than of utility. Type cannot be lost sight of by the sheep-raiser who would maintain a flock with uniformity in character, manner of development and adaptability, whether it is the purpose to dispose of the surplus as breeders or to finish them for market.

The presence of breed type does not remove the necessity of making sure that the animals selected have also the individual points of build that give them the greatest commercial value and that indicate the greatest vigor and thrift. In fine-wool sheep, the fleece is the main point to be studied. After studying the fleece, the vigor and stamina may be judged by the chest capacity and the expression of the face and the carriage and boldness of movement.

Judging sheep. — In the mutton breeds, the same points are relied upon, but it is also necessary, unless the sheep is newly shorn, to use the hands to find out just how the animal is built.

In judging sheep, it is advisable to adopt a certain course of procedure, so that nothing may be missed, and each motion be made to disclose something in regard to the merit or demerit of a sheep. As in judging all other classes of stock, a system of examination should be adopted and very closely adhered to. The best course to follow, perhaps, is to begin at the head. With finger and thumb remove the lower lip so that the teeth may be seen. Then, with the hand under the jaw, look carefully over the head, seeing that the eyes are all right, the head of good shape, no appearance of horns in those breeds that are hornless, while in those with horns note that the latter spring clear from the head. Then pass to the neck, feeling with the hands the course of the neck, and in that way determine the length of it, the thickness of it, and the way it swells to meet the shoulder at the shoulder vein. (See Fig. 29.) Then pass down to the brisket, putting one hand on the floor of the chest and the other at the top of the shoulder, and in this way form an idea as to depth of the sheep through these parts. (See Fig. 30.) Then pass to the shoulder, noticing how it is covered with flesh, and up to the top, also taking the girth or the spring of the ribs of the sheep. (See Fig. 31.) From the

top of the shoulder, using one hand, follow the line of the back to the end of the body. (See Fig. 32.) By carefully handling these parts, the fleshiness of the sheep or the way the ribs are covered and the straightness of the back are determined, and at the same time the spring of the ribs is made apparent. The width of the loin should then be taken, and the covering and the thickness of it should also be noticed. (See Fig. 33.) The width at the hips should then be observed, and turning to one side and using the two hands, the length from the hip to the end of the hind quarter should be made apparent between the two hands. Then the way the hind quarter is carried back and the fullness should also be examined. (See Fig. 34.) Following down towards the leg, the development of the thigh on the outside requires examination. And then with the hand the quarters or the twist between the legs should be firmly felt. (See Fig. 35.) In Figure 36, the proper method of opening the fleece is shown.

Deception in form due to trimming. — In this way, the sheep has been thoroughly examined as to form, but it is to be remembered that the hand should be thoroughly relied on to detect all discrepancies in form, and unless the sheep is carefully handled the examiner is very likely to be deceived. The wool of all show sheep and fat stock is always trimmed, and the trimmer possessing skill can make a sheep of any desired form, providing the wool is long enough

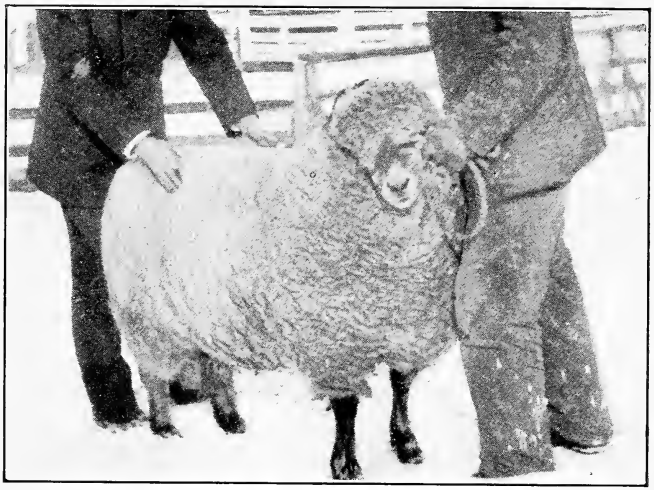


FIG. 33. — Taking the width of loin, also note thickness. (Page 142.)

FIG. 34. — Noting the degree to which the width of body is carried to the end. (Page 142.)

PLATE XIII. JUDGING SHEEP.

and the sheep approaches somewhat towards the form that is being imitated.

Quality. — After the form of the sheep has been carefully gone over, the quality should be noted. The cleanness of the bone, the apparent strength of it, and the nature of the hair that covers the face and legs should be noted. These are important in either breeding sheep or fat sheep. It is, perhaps, most valuable from the butcher's standpoint, because the waste is less from a sheep of good quality than it is from one that is inferior, but sheep of the best quality will not dress much over fifty per cent of their live weight.

The ram. — Aside from the breed type, the ram should show masculinity in many features. In those breeds that have horns, the latter should spring strong from the head and turn free from the face. In all rams, the face should be broad between the eyes, somewhat short, with a strong nose. The crest or scrag should be thick and rising and the neck full. A point deserving emphasis is the depth of the chest. The body should sink deep between the fore legs, and the ribs back of the shoulder should be deep and round, making the girth large and the brisket prominent and wide, — two features that are indicative of a strong constitution. A live fleece — that is, one that is springy and not dead to the touch, and especially a dense, thick covering of belly wool — is also indicative of vigor or constitution.

For the same reason, in those breeds that are wooled about the head, the more complete and dense this covering is, the better it is liked. The legs of the ram should be straight and strong and short. In movement the ram should be bold and active. This is often influenced by the condition. A ram should never be so heavy in flesh as to be useless for service, as is too often the case in the show ring. The flesh should be even and firm and not gathered in masses or rolls at any part of the body. It is very apt to gather at the fore flank, leaving the back bare or raw. Excessive condition is likely to make the ram unwieldy in action or result in broken-down pasterns, which usually render a ram useless for breeding purposes.

The ewe. — The ewe should be rather long in the face, with fine features. The neck should be slender and without any of the thickness noticeable in the ram. The body should be deep, round ribbed, and specially long so as to provide room for the growing lamb. The type of the good milking ewe verges strongly towards that which is typical of the good dairy cow. The ewe that milks well, and consequently rears early maturing lambs, tends towards the wedge shape, deep in the chest, large bodied, and wide across the loins and the hips. The condition of the ewe should not be such as to impair her breeding qualities. Excessive fatness, as a rule, is in this way injurious. The flesh should be evenly distrib-

uted and not gathered in bunches about the tail head, and it should be firm and not flabby. A good way to select breeding stock is to study type and fleece first and then the bodies after shearing. Such a plan is not often practicable, but when it can be followed, it is most safe and instructive.

Need of uniformity in ewe flock. — Ewes that are of the right size and general build and true to the features of their breeds, and at the same time of a high degree of excellence in fleece and form, are not to be had at ordinary prices. Since something must be sacrificed, it had better be points of conformation than type. With all the ewes of the same general build and type, it remains to so breed and select as to overcome the individual defects. Ewes of the blocky, compact, heavily muscled kind, coming from prolific vigorous stock of the same kind, are sure to prove satisfactory under fair treatment. Some defects of form may impair their market value, but such are less serious and much more readily corrected than is a variety of type. It is easily possible within any one of the breeds to find a range of type running from the kind that get ready for market at an early age to those much larger that grow through a longer period and fatten at greater weight, but much later. Each may be profitable under its own conditions, but cannot be so in the same flock at the same time. In such a mixed flock, the lambs cannot all be marketed at once, or if they are, their lack of

uniformity in appearance, size, and condition lowers their value greatly. If, for any reason, the owner allows part of his ewes to be of a type different from that decided upon at the outset, he has made future progress both difficult and unnecessarily expensive. Good individual ewes of a different sort may seem well worth the price asked for them, but if they are not of the same sort as the rest of the flock, one of two undesirable things is inevitable. To bring the lambs of the off-type ewes to the standard set, a special ram must be used, or if this is not done, part of the lambs will be less economical gainers than the others and thus raise the cost of production, while the diversity of appearance and character lowers the selling value. The breeder will find enough to occupy him in maintaining and advancing the standard of his flock and breeding out individual defects without at the same time assuming the task of bringing in and fixing the correct type in one part of the flock.

CHAPTER VI

THE IMPROVEMENT OF THE FLOCK

HAVING secured his foundation ewes, it is thenceforth the aim of the owner to enlarge the flock by the retention of the females in the increase. Within five or six years at the most, the original stock will have been disposed of as no longer capable of breeding. The ewe flock will then consist entirely of animals bred by the owner. Real success demands that there be a continuous improvement in uniformity and in average individual merit. At the best, the foundation ewes will have some points susceptible of improvement, or it may become apparent that a change in some feature would add to the profit from keeping them. In the correction of defects and effecting of improvement, the flock owner has three opportunities, all of which he must utilize in advancing toward his ideal of a flock of maximum efficiency for his purposes. The first of these is in the selection of rams. The second opportunity is in the culling of the ewes, and the third is in the growing and developing of the lambs.

Selection of rams. — Truest economy calls for the highest degree of excellence in the ram. Needless to say, he should strongly represent the type that is

to characterize the flock and should exhibit the pronounced individuality and vigor that indicate prepotency or the power to impress his qualities upon his get. This much assures the maintenance of what has been secured in the ewes. In addition, the sire must have marked strength in the main weak points of the ewes. While it may at times be necessary to use ewes that are not pure bred, the ram must be eligible to record. Some well-bred but unrecorded rams may be better breeders than some that are recorded. The advantage of eligibility to record is not in the fact of the registration of the sire and dam, but in the fact that registration makes it possible to know from what kind of stock the ram is bred. A ram with the character described is not likely to come from substandard parents or grandparents, but theory and experience both prove the wisdom of knowing the pedigree or ancestry of a breeding animal whether pure bred or grade. The first thing to consider in a pedigree of a breeding ram or ewe is the breeding records of the sire and dam. They should be judged by the uniformity and merit of their other offspring. The son of a young ewe may prove successful as a sire, but the risk of failure is much less in selecting the offspring of a ewe known to have produced other lambs that are robust, well made, and true to type. The breeding qualities of the ram's sire may be judged by a single crop of lambs, though it is still safer if there

are older sheep to represent him and to show the breeder's faith in him. If the parents pass the test of inspection of their other offspring, this should be assurance as to their similarity in type. Their individual points cannot be ignored, but sheep that are old enough to have the offspring of several years to speak for them are not likely to be very attractive in appearance. The first parents constitute the most important part of a pedigree. Failure of parents to stand such a test cannot be atoned for by the excellence of the grandparents. This is highly desirable, but must be looked upon as added assurance of the worth of the parents rather than as an excuse for their shortcomings. If grandparents and great-grandparents also are known to have been good breeders, the descendant of such a line has still less chance of being a poor breeder. As the number of generations of careful weeding out of all sub-standard animals is added to, there is an increasing degree of purity of the blood and freedom from the possible appearance of inferior features. The chief real reason for the popularity of imported sheep is in the fact that they usually come from flocks that have been bred with the greatest care for so many generations that the blood is more nearly pure to good tendencies and therefore stronger in transmission than is the case with animals from flocks that have not been bred for a long time according to an uninterrupted plan.

Such a plan of procedure in selecting a sire involves time and study and commonly some expense. Since, however, it is the only opportunity to influence the inheritance of the lambs of the ewes that are to be bred, the effort is a necessary one. The owner's skill in breeding determines the success of the stock-raising venture, and the selection of sires offers the main opportunity for the investment of time and skill.

Study of pedigrees. — It is not only practical, but imperative, to study pedigrees in the way that has been discussed. In some cases, an animal that has defects but is backed up by parents and grandparents that stand the test may be more dependable than another that is superior individually but not vouched for by his forbears. No rule can be laid down to guide in a choice between individual merit and merit in ancestry. There is great danger of allowing esteem for an animal to blind one to the defects of that animal's offspring. A safe way is to investigate the ancestry of only those animals that first command attention by their own merit.

Pedigree is sometimes spoken of as "a promise but not a guarantee of performance." Occasionally there is an opportunity to procure sires that have produced offspring of uniformly high character. This is a guarantee of performance, and such a sire is much to be preferred to the most promising untested one. Even with a proven sire, however, it

FIG. 35. — Feeling the development in the leg of mutton. (Page 142.)

FIG. 36. — Manner and place of opening fleece to see finest quality of wool. (Page 142.)

PLATE XIV. JUDGING SHEEP.

is necessary to consider the blood lines and type of the ewes to which he has been bred in comparison with those of the flock in which it is proposed to use him. If he had made a strong impress for good upon his get from a large number of ewes or even a smaller number of varied strains, it would indicate strong prepotency. Fortunate "niches" come from some matings that are not duplicated when either parent is paired with a new mate. Even with the greatest effort, one cannot be certain he is procuring a great sire. With reasonable care, even in choosing an untried animal, he can avoid an objectionable one. Fortuitous niches and unusual strong sires are procured by continually aiming for the best to be had, and the men who own them always owe their good fortune to good judgment and careful study more than to chance or extraordinary financial resources.

Testing rams. — In the larger pure-bred flocks where breeding is most carefully done, a young ram is always tested before being used extensively. Of course, only those of best individuality and parentage are considered as sires, but they are required to demonstrate their prepotency before receiving an opportunity to impress any great number of offspring. A practical way of making such a test is to breed the ram to five or six ewes or possibly a smaller number of old ewes whose breeding record is known well enough to allow a clear estimate of the ram's influ-

ence when the lambs arrive. The greatest concern as to the success of a sire is occasioned in selecting the successor to one that has worked a marked improvement in the flock, and the new one should be procured and tested before the older one is disposed of. One advantage of a large flock is that when once a ram is found to mate well with the ewes, he can be retained for use with the same ewes so long as both remain useful, and further experiment with that part of the flock is unnecessary, and the superiority of the lambs of such older ewes can be relied upon.

If the ram selected for the young ewes sired by the older one proves unsatisfactory, a loss is occasioned, but by no means so great a loss as there would have been if all the lambs of that year's crop were by the new sire. In this way, the owner of a large flock has an advantage in being able to breed his ewes to the same ram year after year. He can try them with another according as the character of the previous lambs or the individual characters of the ewes and rams suggest. Even in a flock of less than forty ewes, the extra trouble of keeping an extra ram and of doing the fall mating in two groups would often be repaid many times over by the greater improvement secured. Sheep-raising is not likely to prove to be interesting or remunerative unless progress is being made. Progress is a dividend upon what has been put into the venture. In sheep-breeding,

the most important part of the investment is the study and judgment that are brought to bear in making the matings. No lavish expenditures of money for fancy equipment or for breeding animals not adapted to one another or to their conditions can ever give results if skill in mating and developing is lacking. On the other hand, the careful breeder who selects wisely, holds closely to his type, and allows his sheep full opportunity to develop up to the limit of their inheritance will succeed with the use of a very limited amount of capital.

In-breeding and line-breeding. — The question of mating ewes to rams that are related to them sometimes becomes a very practical one. Good breeders disagree as to the advisability of the practice. Its effects are sometimes notably good and at other times as plainly bad. The reason for the difference in results is manifestly due to the particular conditions, as the forces governing inheritance are always the same.

Robert Bakewell's rule of breeding was to breed "the best to the best." He had no contemporaries and was limited to his own flock for the selection of rams. His success has been referred to in the discussion of the Leicester breed. In the Southdown improvement, John Ellman also mated related animals, and owners of some of the prominent flocks of the present day prefer that part of the blood of the ram should be the same as a part of the ewe's blood.

Some of the best American fine-wool flocks are line-bred. In other cases in which the rams have been selected from within the flock for a number of generations, there has been a most serious decrease in size and robustness, the latter sometimes especially noticeable in young lambs.

Before attempting to explain the varied results from close matings, the two terms in common use, in-breeding and line-breeding, may be considered. In-breeding and line-breeding are essentially the same. The distinction between them is not one of principle, but of degree. There is no agreed line of demarcation between them, and what some persons call in-breeding may be referred to by others as line-breeding. Animals that are in-bred have parents that are related much more closely than are the parents of line-bred animals. The mating of sons and daughters of the same ram or of the same ewe is in-breeding. A close mating such as that of sire to daughter or son to dam would be a close form of in-breeding. Any mating less close than that of being half brother and sister would be more properly spoken of as line-breeding. Line-breeding, or breeding in line, implies a succession of sires that trace their descent to a common animal not too far removed.

The explanation of line-breeding is not to be found in the fact of the relationship of the parents. Because such parents have a common near-by ances-

tor, they are likely to hold in common the characteristics of that common ancestor. These common characters may be good ones or poor, or they may comprise both. The principle of the matter has been tersely stated in these words: "The injury from line-breeding comes not because of kinship in blood, but because of kinship in defect." The concentration of the blood of a single animal that is the result of line-breeding serves to concentrate and perpetuate the characters of that animal. The result is not from the fact that the parents are related. No new character or qualities are brought about, but simply extra likelihood of resemblance to the animal whose blood is concentrated. Some of the successful breeders who do not favor the practice of concentrating the blood prefer to concentrate the type. They use a succession of sires that are no blood relation but which are of the same type and individual qualities. When it can be done, concentration of type serves as well to secure the uniformity and prepotency that results from in-breeding or line-breeding. It is doubtful, however, whether the effect is quite so pronounced when a number of similar animals are used as when the same individual appears a number of times in the pedigree.

Many of the early improvers and founders of the breeds worked under conditions that afforded no field for the selection for similarity of type. To concentrate type, they were forced to concentrate

blood, because the best sires outside their own flocks were inferior to the ones they had bred themselves. The same is true of some breeding flocks of the present. Because of the exercise of extraordinary care and skill, some breeders who are holding to a special type within a breed are themselves limited to their own flocks in selecting the material to effect further progress. Such are the breeders who breed their own stud rams. Such a course involves some risk of injury to the flock in which it is followed, but when carefully done, it gives the stock an extraordinary prepotency that is invaluable to any other flockmaster who aims at the same type.

It was said that a succession of sires unrelated but of similar type was scarcely so certain of results as the succession of related ones. The success of either plan depends more upon the judgment exercised in selecting those sires than upon the system. The same is true of any other phase of breeding.

Since the principle of the matter is that the characters of a single animal are perpetuated and held together by close matings, there can be no gain in concentrating the blood of any but the animals of the highest excellence. Whatever apparent or concealed weakness they have will also be made more pronounced, the apparent ones becoming more serious, and those not apparent becoming strong enough to exhibit themselves very markedly. The flocks that have been ruined by the use of their

own rams owe their disaster to the fact that the reliance was placed upon kinship of blood rather than upon kinship of excellence without defect. No matter what progress be made in fixing good qualities of fleece and form, it can avail nothing if in the same animals there was concentrated a tendency to low vigor or low fecundity. The advantage of line-breeding lies in the fact that the animals mated are some distance removed from the common sire, and opportunity is allowed to select individuals having the valuable qualities it is desired to preserve and yet are free from the weaknesses of the strain. So it appears that the question resolves itself into a matter of not losing sight of individuality and considering ancestry at more than its real value. The old rule of "the best to the best" still holds good. So long as one can obtain a ram from outside his own flock that is better calculated by individuality and parentage to bring about the improvement desired, he should do so, and no longer. This assumes that the breeder is as fair and impartial in judging his own stock as in judging that of others. Such ability is the exception rather than the rule. If upon examination of the pedigree of a ram that is individually satisfactory and from approved parents, it should develop that a grandparent or more remote ancestor is one that also appears in the pedigree of the ewes for which the ram is intended, then the existence of such relationship is desirable

rather than otherwise, provided the animal whose name appears in both pedigrees produced the right kind of stock and that his weaknesses do not appear in the descendants to be mated.

There is one other point that can best be emphasized when mating of related stock is under consideration. Breeders are prone to make their selections upon a too narrow basis. Especially is this true when some special excellence of fleece or form has been secured, and it is desired to perpetuate it. Interest is centered in the special features, and the fundamental requirements of constitutional vigor are ignored, with the result that they may become so impaired as to nullify all the good that has been secured. Constitutional vigor can be preserved and improved just as can any other character if the matings are directed toward that end.

Culling the ewes. — The selection of breeding ewes is of no less importance than the selection of sires. While a single ewe has only a fraction of the influence that the sire has upon the future of the flock, yet the standard that is maintained in the ewe flock has as much to do with progress as have considerations that concern the rams. At the best, only a part of the ewe lambs of any season can be worthy of being allowed to contribute to the future lamb crop. The culling of the ewe lambs must be based first on their individual merits as shown by type and points, then upon what may be known of

other lambs of the same parents. When there is doubt, it is practicable to breed the young ewe once and determine her fitness by the merit of her offspring. In all this there lies, for most persons, the great danger of retaining unworthy ewes through a desire to increase numbers or through inability to see defect where excellence was hoped for. In some German flocks, outside experts are employed to cull the ewes and to sort them into lots, for each of which a special sire is chosen.

Developing the lamb. — It was stated in the beginning of the discussion of improvement that three opportunities presented themselves. The first was in the selection of sires, the second in culling the ewes, and the third in developing the lambs. The first two are equally important in determining the inheritance of the lambs, the last has to do with the utilization of the inheritance. The way in which the lambs are fed and cared for, their environment, cannot be said to be either more or less important than their inheritance. Both factors must be fully attended to if progress is to be made.

The chief consideration in the choosing of a breed and type was adaptability to the conditions under which the flock was to be kept and the plan of their handling, that is, the age and weight to sell, and kind of feeding. The foundation stock consisted of representative animals secured from a flock accustomed to the same kind of treatment.

By this means and by later choices of sires and cullings of ewes, the inheritance has been arranged for. The inheritance consists in ability to use feed to produce a particular kind of fleece or carcass and to develop rapidly under liberal feeding or more slowly if the feeding is on a different order. The significance of the adaptability of the parents is wholly lost if the lambs are not afforded an environment during their growing period that corresponds to that in which and for which the breed was developed. When the lambs are afforded ample opportunity to do what is expected of them, the way they respond can be given a good deal of weight in determining which ones should be discarded. If the care they receive is not equal to that furnished the foundation stock, then there is no means of knowing whether or not they are the equals of their parents, and there is no reliable way of checking upon the breeder's work. The importance of fairly testing the merit of the lambs should further emphasize the need of a clear plan of management before starting in. Otherwise, after a few years have shown the most profitable plan of handling, it may be found that another breed is needed. In such a case, a fresh start must be made, and the experience gained is all that remains, whereas if suitable stock had been procured at first, the returns and the improvement effected would be more satisfying than bare experience.

Cross-breeding. — The crossing of established

breeds of sheep is justifiable or necessary only in breeding for the market. While it is true that crossing was practiced in forming existing breeds, it was practically always the object to impart some characters of an established breed to stock that had not been previously improved. Present-day use of cross-bred sheep for breeding purposes would be necessary only in cases where it is impossible to procure a breed of the kind needed. To some extent this is true of western state ranges, where cross-bred ewes are quite largely used for breeding purposes. It is by no means agreed by all range breeders that crossing is necessary, but it is true that, aside from the Merino, they have no breed that is the product of similar conditions. The crossing that is practiced necessitates extra expense in purchasing ewes at intervals and makes steady improvement impossible. Ewes of Merino blood that are to be discarded on account of age are sometimes bred to rams of the mutton breeds. The ewes with their cross-bred lambs are more salable to feeders and for mutton, the lambs of both sexes being marketed and the breeding flock kept pure. In parts of England and Scotland, the hill and mountain breeds are crossed with rams of the lower country breeds. This is done in order to secure lambs that are more suitable for the feeders than those of the pure native breed. The ewe flocks are kept pure. This is necessary because of their adaptability to the

country and the conditions under which the flocks must be maintained in the interests of practical economy and profit.

The farmer has seldom any need to cross breeds for the above reasons. The practice requires the purchase of other rams, and the flock must be bred in two parts, one part being mated to rams of their own breed to furnish fresh ewes to keep up the breeding flock. If all the ewes produce cross-bred lambs in any season, there is no opportunity to make a change in the ewe flock that year. It is generally considered that the crossing of breeds has the specific effect of giving greater vigor and more rapid growth than characterizes either of the parent breeds. The extent of any such advantage over carefully raised pure-bred sheep has not been determined by experiment. The possible advantage from cross-breeding in farm flocks is seldom very great, and the practice can be followed safely only when the main ewe flock is kept pure.

CHAPTER VII

AUTUMN MANAGEMENT OF THE FLOCK

The various and numerous details of flock management can be discussed most logically by taking them up in natural order, beginning with the autumn. The beginner with sheep is likely to make his purchases in the fall. With the established flock, the fall is the time for closing up the old year and putting the flock in shape to produce the next crop of lambs. Only the breeding sheep will be discussed, the needs of the weaned lambs at this period being treated as the last consideration of summer management. The aim of the shepherd, beginning with the autumn season, should be to have his ewes improving in condition so that they may be prepared for the winter season. There are various details relating to the management and feeding that require attention at this time, chiefly with the object of having ewes in such thrift that they will pass through the winter season and the lambing season with the greatest success.

Sorting the ewes. — The important things to be attended to in the fall are the culling of the ewes, having them get in lamb, and the selection of the rams. In fact, the latter matter should by no means

be deferred until the fall. The culling of the ewes is equal in importance to the choice of a ram. The fall flock should contain no ewes past breeding age that have not had or raised lambs. Keeping a ewe that has failed to get in lamb in a fair season is a doubtful matter. Such should be in good condition in the spring and can be disposed of then and leave their room for more productive individuals. Two factors determine a ewe's fitness to remain in the breeding flock. The first is the character of lambs she has raised, and the second her prospects for usefulness as shown by age and condition. The lambs will have been taken away some time previous to the time of sorting out the ewes for breeding. Unless the shepherd is sufficiently familiar with the flock to be able to remember what kind of lamb each ewe raised and how she nursed it, some plan should be adopted to facilitate the sorting of the ewes on that basis. In flocks in which ewes and lambs are numbered and entered in a flock book, it is no great task in going over the lambs to mark the numbers of the poorer ones, and to then make a list of the dams of the cull lambs for guidance in sorting. Ewes with spoiled udders should also be marked for the butcher. The best milking ewes are likely to be lowest in condition, and if appearance and condition are the only guides, the best breeders are liable to be put among the culls and the poorest mothers retained.

Age of breeding ewe. — It is generally considered

that a good breeding ewe should be kept as long as she will breed. Occasionally there are ewes that will continue to breed good lambs until nine or ten years of age, long after they have lost the power of getting into marketable condition. In pure-bred flocks, the extra value of the lambs from such ewes much more than overbalances the loss from being unable to realize upon them when they finally succumb. Special attention in feeding such ewes after their teeth are gone is also well repaid. In a strictly commercial flock, however, it is more economical to discard ewes before they are too far gone to bring a fair price from the butcher. The aim should be to keep the flock composed mainly of ewes four or five years old. Two-year-olds with first lambs are not as reliable as when older, and the third and fourth years should be the most profitable ones. After five years of age, a ewe is likely to have a broken mouth and to be less thrifty on that account. The age of losing the teeth varies with breeds and individuals.

Dentition of sheep. — The age is told largely by the order of the appearance of the permanent incisors. The temporary incisors that are characteristic of lambs are quite different from the permanent ones, which begin to appear when the lamb is about one year old. The temporary incisors are very long and narrow and constricted at the neck, and they are white in color. There are eight of these, and they

seem to be replaced very regularly by a permanent pair of incisors each year. The difference between temporary and permanent teeth can be readily learned by studying the mouth of a sheep known to be one or two years old. The first pair of central permanent incisors usually make their appearance when the lamb is about one year old, and they attain their full growth a few months later. The next pair, that is, one on each side of the central pair, make their appearance about one year later, so that the sheep has two pairs of permanent incisors when it is a little over two years old. The third pair appear the next year, making the sheep slightly over three years old when there are three pairs of permanent incisors. The last or fourth pair, that is, one of each end of the row of incisors, appear when the sheep is slightly over four years old. As a rule, the mouth is full when the sheep reaches five years old. In the instance of lambs that have been forced when young, the teeth very often appear before the ordinary time, and there are many instances of variation from the time that has been given. With advancing age, the teeth show wider apart, and when shed, handicap the animal greatly in grazing.

It is not necessary to part the jaws in examining the teeth. Standing at the left side of the sheep, hold the head firmly against the thigh with the right hand and with the two forefingers of the left hand

separate the lips sufficiently to allow a view of the teeth.

Breeding yearling ewes. — The number of ewe lambs will ordinarily be considerably greater than the number of ewes to be cast off. This allows a thorough culling of the lambs to be made. In the fall of the yearling form, they can again be gone over and only the most promising used to replace the old ewes that have been discarded. It is very desirable to breed yearling ewes to an old ram that is known to be a sure breeder and a good sire. When this is done, there can be no mistake in selling those that fail to produce good lambs because the inferiority in the lambs in such cases is properly attributed to the ewe.

Time of mating. — The time at which the breeding season begins will depend largely on the local conditions and the parentage of the flock. It will be generally found that ewes of Dorset descent or Merino breeding may be bred at unusual seasons, but with other breeds of sheep the usual breeding season is either in September or October. It usually begins with the first cold weather that comes in the fall. The length of the winter season and the time at which the ewes may be first turned on pasture are the factors which are mainly involved in deciding the beginning of the best period to have the ewes lamb. The ewe carries her lamb about one hundred and forty-seven days, though this may vary three or

four days, either longer or shorter. Under northern conditions, it is advisable to arrange the breeding season so that the lambs may be dropped about two or three weeks before the flock is to be turned out on pasture. The chief reason for this is that if the flock is on pasture at the time of lambing, less attention can be given to the lambs, and there are some changes likely to take place in the milk of the ewes that will cause scouring among the lambs.

Need of having stock in good condition. — The inheritance of the lamb expected is arranged for and determined beyond direct control when the matings are arranged. It should always be borne in mind that the ewe's impression upon the lamb is conveyed solely by an ovum or egg discharged from the ovary at the time of breeding. The sire's contribution to the inheritance of the lamb is conveyed in a single spermatozoön, microscopic in size, which unites with the ovum. This union constitutes fertilization, and the cell so produced, supplied with nourishment from the dam's circulation, develops into the new individual. The hereditary material from the parents is more likely to be active and potent in developing the qualities it conveys when the body of the parent is in a vigorous, healthy, and well-nourished condition.

Advantages of flushing ewes. — There are other advantages in having the ewes in strong condition when they are mated. A shorter lambing season

is insured, as the lambs are dropped more nearly together, and there may be a larger number of them than there would be if the ewes were in a low condition at breeding time. We have not a very complete knowledge of the conditions that govern the discharge of ova from the ovaries and the number released at any one period. The ova are produced during the period of heat, but, except in the Merino and Dorset breeds, few ewes come in heat without the stimulus of the cooler nights following the summer season of the section in which they are kept. Imported English ewes kept in California take the ram upon the approach of the comparatively cooler nights of July and August, much earlier than the same ewes had previously come in heat in England. All direct attempts to induce coming in heat by artificial means have been unsuccessful. It is reasonable to assume, however, and experience justifies the assumption, that there is a relation between coming in heat and the body condition. Ewes that are abnormally fat are likely to show the results of the fattening conditions in the impairment of the functions of the ovaries. The same is true of an abnormally low or under-nourished condition. When the ewes are all in uniformly good condition, they will therefore come in heat regularly and be likely to get in lamb. If the ram service is properly arranged, the majority of the ewes will get in lamb at the first or second service. Since ewes come in heat

at intervals of from fourteen to twenty-one days, this gives a lambing time of the same length for the ewes in lamb to service in the first or second heat period after the ram is turned in. Considerable attention is required for lambing ewes, especially for those producing their first lambs. It is easier for the shepherd to care for a number of ewes and young lambs each day and night for a short time than to have them come straggling along through several weeks. The lambs are then uniform in size and get well started under the same conditions.

The number of lambs produced is determined by the number of ova produced by the ewe. The ram may sometimes be unable to produce spermatozoa to fertilize the ovum, but there are no grounds for believing that the reason for single or twin lambs lies with the ram. It is true that the opinion is sometimes held that a ram that is a twin gets a larger percentage of lambs than one that was a single lamb. The number of spermatozoa contained in the seminal fluid at each service runs into the thousands. Over-use or otherwise impaired conditions may lower the number or suspend the production of the spermatozoa altogether, or it may cause them to be less vigorous and active in traversing the passage toward the ovum. For these reasons, the management of the ram is an important factor. But it is most improbable that if one spermatozoön should fertilize an ovum, another ovum produced at the same time

should fail to be fertilized for lack of a second active spermatozoön among the thousands produced.

Ova produced by ewes. — In an investigation made by Dr. F. H. A. Marshall of Cambridge University, England, 55 ewes were slaughtered and their ovaries examined during the mating season. Of this number, 42 had discharged one ovum only; 7 had discharged one ovum from each ovary; in 5 cases, two ova were discharged from one ovary; and there was 1 case in which two were discharged from one ovary and one from the other. This number of ova corresponded to the proportions of twins and triplets common in the breed to which the ewes belonged. Ewes that are in good condition may be expected to produce two ova more frequently than they would if in a low condition.

The fact that the ewes that lamb earliest produce more twins than the late lambing ewes is sometimes held to show that the ram is most prolific early in the breeding season. The more reasonable explanation is that some ewes are sexually more active than others and for the same reason come in season and get in lamb first. Taking the ground that the ram does not govern the number of lambs so long as he is in reasonable condition, does not oppose the idea that a male may transmit the fecundity of his dam to his daughters, which would enable him to influence in some degree the number of his descendants in the second generation, but not in the first.

Having ewes in condition to insure a short lambing season and a good percentage of lambs does not mean that they should be in market or show condition. The main thing is that they be gaining when bred. The methods practiced by British shepherds for getting ewes into good breeding condition is called "flushing." After weaning the lambs, it is desirable to run ewes on short pasture until the flow of milk has stopped. After this, if they are turned on good pasture, nothing more is ordinarily needed. Good grass pastures will suffice or, if that is not available, rape or rye or other forage crops will answer. If there is no suitable grazing, a light ration of grain containing not more than one half corn can be used to good advantage. There is no advantage in stinting ewes that are in lamb. The demands of the fetus are not so great at first as in the last months of pregnancy. A continuation of the food given at breeding time might bring the ewes into higher condition than is necessary or desirable, but this will depend upon the pasturage and the feeds at hand during winter.

The ram in the breeding season. — The main requisite in the management of the ram during the breeding season is to prevent his getting into a run-down condition through overuse or underfeeding or both. If either of these conditions is permitted, there may be a total suspension of the ability to breed, but this is not likely to occur in farm flocks of ordinary size. On the range where feeding is not

always practical and the demands are extreme, troubles with stock rams are more common. Abnormal condition, either from underfeeding or overfeeding, is likely to result unfavorably. A good robust, vigorous condition with moderate fatness is what is needed in the ram at the beginning of breeding and should be maintained as far as possible during the season.

Number of ewes to a ram. — A ram that is a yearling or older, when running in the field with the ewes, should serve fifty ewes. To do this, he should be taken out and fed grain at least once each day. Ram lambs will do well as sires if well grown and used only moderately. About twenty is as large a number of ewes as can be relied upon for good results when bred to a ram lamb.

If more than one ram is mated, it is good economy to divide the ewes into flocks according to their adaptability to the separate rams. If rams are kept up, however, each ewe may be assigned to a particular ram as she comes in heat and is ready to be bred. By keeping the ram away from the flock, he can care for nearly twice as many ewes as when running in the field, because each ewe is served but once and the ram's vitality thereby conserved. When this plan is followed, the ram is turned among the ewes in the morning or both morning and evening. The ewes that appear to be in heat are taken out and allowed a single service. A ram well cared for and

bred on this plan may serve two or three ewes both morning and evening for a limited number of days, and a well-cared-for mature ram so handled can get one hundred ewes in lamb in a season.

Marking the bred ewes. — Whether the ewes are bred in the field or the barn, some plan of marking is necessary in order to keep track of when the lambs are due. For field breeding the common practice is to paint the breast of the ram each day. When this is done, it is easy to tell which ewes are bred and to take their flock numbers and record the date of service. If the color of paint used is changed at intervals of ten days, it is possible to know which ewes have come in heat again and how sure the ram is.

When hand-breeding is practiced, that is, when the ram is not allowed to run with the flock, the ewes can be marked as bred. Those bred the first week may be given a small mark on the left shoulder. Those bred the next week upon the left side, those the following weeks upon the right shoulder and side or other places. This makes it possible to go into the flock at lambing time and readily separate out those due to lamb in any week and place them in suitable quarters.

CHAPTER VIII

WINTER MANAGEMENT OF THE FLOCK

Success in bringing sheep through the winter in good condition is dependent upon the observation of a few principles aside from feeding. While some shelter is necessary in practically all localities, nothing in the way of close housing is safe, especially with ewes in lamb. Good yard accommodation in which the sheep can keep on dry footing and have plenty of room to exercise is the first requisite. In the house or sheds, about fifteen square feet of floor space is necessary for an average-sized sheep. The fleece affords sufficient warmth while it is dry, and for this reason the main need in a shed or sheep barn is protection from storms and plenty of ventilation without drafts. If the quarters are airy and comfortable, the sheep will resort to them whenever necessary. On most dry nights, they will prefer to be out of doors and will winter much better if allowed to do so than they will if kept confined in close or crowded pens. It is usually more convenient to have the feed racks inside, but some of the rough feed should always be fed out of doors. With breeding ewes, toward lambing time there is danger of injury

and loss of lambs from crowding through narrow doorways. It is a good plan to provide an old sod upon which the sheep may remain until winter storms make it necessary to take them nearer the barns. With dry footing, sheep are better off to remain in the fields as long as possible, and if some grass has been allowed to cure upon the ground, it is a good place for the ewes during the daytime until snow becomes deep or the ground becomes wet.

Division of the flock for wintering. — One advantage of a large flock is that the sheep are more likely to be sorted by age, sex, and condition into various lots for wintering. In a small flock in which all kinds are run together, some members of the winter flock are sure to get more or less feed than they need. It is first of all desirable to have one shelter and lot for ewe lambs. If the wether lambs and cull ewe lambs are to be sold fat after shearing, they may run the first part of the winter with the good ewe lambs and be separated later to be finished for market. Ordinarily, however, it will be found more economical to dispose of all the lambs that are not wanted for breeders in the fall and use the winter feed and quarters mainly for a large number of breeding ewes. When ram lambs are kept over to sell as yearlings, they will need to be in a separate group. Stud rams may run with the ewes in lamb, but unless very quiet will be better kept away as lambing time approaches. The number of ewes in lamb that will

do well together varies with the breeds, but they will thrive better in lots of forty or fifty than in larger numbers. Ewes carrying lambs for the first time need extra feed and attention and can make up a separate lot to good advantage.

The breeding ewes in early winter. — The aim in wintering breeding ewes is to bring them to lambing time in good vigorous condition and in medium flesh. The health and vigor desired cannot follow a close in-door winter life. The feeding required will depend upon the season and the condition of the ewes at the time the pastures are abandoned. It sometimes happens that ewes that run out until late in a wet fall when the grass is heavy but soft come into quarters quite thin. The only safe guide as to condition is the feel of the backs when handled. By going among a lot of ewes in the pen or barn and noting the covering of the vertebræ, especially of the loin, one can quickly tell just how they are doing and which ones are falling behind and need to be separated out for extra feeding. It was advised that ewes carrying their first lambs be made a separate lot when possible and given extra feed. If this is done, those that are behind the others in the older flock can be put with the young ewes. When the fall grass is soft and washy, it is good economy to start with some dry feed before the ewes are taken from the pasture. Hay may be used at this time, though a feed of about one-half pound of grain for

each ewe daily can usually be taken to them more conveniently. Rape sown with small grains or at the last planting of corn can be utilized to furnish fall grazing. Rye sown early will afford fall feed and also be useful in the spring. Such crops must be largely used in maintaining a flock upon high-priced lands. They afford fresh ground, which is necessary to good health and freedom from parasites. They make it possible to keep fewer acres in grass, though the raising of them entails some extra labor that is more than repaid by good sheep, as they gather the crops themselves with a minimum of waste. The use and need of such crops in sheep-farming calls for more detailed reference in the chapter devoted to summer management.

Roughages for ewes. — Sheep that enter the winter in good heart can be carried until nearly lambing time without grain feeding. To do this, however, a good supply of clean, well-cured roughages is necessary. Red clover or alfalfa hay are well-nigh indispensable, indeed without one of them grain feeding must be resorted to. Corn fodder can be used in wintering ewes, but it should be well cured. It is most satisfactory for feeding on dry ground some distance from the barns, so that the ewes get exercise going to it and while feeding. Of course the waste would preclude such use of fodder outside the corn states, but the value of having a feed to use out of doors is considerable. Pea straw, where it is ob-

tainable, is excellent sheep feed and is often fed upon the snow. Its value is nearer that of clover than is that of any other straw. The advisability of cutting fodders for sheep can be determined mainly on the value of the fodder and the waste that is saved by so doing. The advantage to the sheep is of no great consequence. British shepherds rely largely upon roots in wintering sheep. Some of them consider that a liberal use of turnips is unfavorable to a good lamb crop, but some form of succulent feed is highly desirable. Corn silage can be used to furnish succulence, though some losses and a good deal of trouble have been occasioned by feeding silage. The greatest danger seems to be in using spoiled silage. Sheep are peculiarly susceptible to injury from any moldy or gassy feed, and such conditions are likely to exist when corn is put into the silo too green or has kept poorly. When good dry fodder or hay is used as part of the rough feed, a good quality of silage can be used to good advantage. Account needs to be taken of the amount of grain in the silage, as the ewes may be made overfat if the rest of the ration is of a fattening nature. An experiment conducted at the Wisconsin station several years ago gives a good line on the comparative values of various feeds. In all lots, the ewes were fed one-half pound of oats each per day during the first four weeks, and this was changed to a similar amount of bran for the last four weeks. The results were as follows: —

Fodder under Trial	Quantity of Fodder under Trial Eaten	Sugar Beets	Oats or Bran	Amount of Refuse	Increase in Live Weight per Head in Eight Weeks
	lb.	lb.	lb.	%	lb.
Corn fodder (cut) . .	1.75	3.1	.5	20.	10.6
Oat straw	1.1	3.1	.5	22.	1.
Bluegrass hay . . .	1.5	3.1	.5	6.2	4.8
Corn Silage					
Oat hay (uncut) . .	2.1	2.5	.5	33.	19.1
Oat hay (cut) . . .	1.5	2.4	.5	25.	4.7
Alsike clover hay .	2.	2.8	.5	16.	19.
Hay					
Corn silage	2.2	1.5	.5	6.	1.6
Sugar beets . . .	3.3	1.5	.5		7.
Clover silage . . .	2.3	1.5	.5	12.9	7.3

Grain for ewes in lamb. — The amount or kind of grain that should be used will depend upon the character of the other part of the ration. With some silage carrying the ordinary amount of corn and alfalfa or clover hay, little or no grain should be needed, but this can be determined best by the condition of the ewes as revealed by going among them. Oats are a staple feed for sheep, but their value often makes it advisable to use a nitrogenous roughage and a carbonaceous concentrate. Toward lambing time, the growth of the fetus makes demands for such elements

as occur in oats and bran. These feeds also favor a good milk flow, and their use for a few weeks before and after lambing is highly desirable. The same results may be obtained from other combinations of feeds after experience has been gained, but the only objection there can be to the use of oats and bran at this time is their cost.

Accessories to the ration. — The breeding flock should have access to water at all times, especially is this true after they have lambed. It will be found then that ewes seem to have an inordinate thirst for water, and it should be supplied to them liberally. Salt should also be within their reach. If they have access to it at all times, they will never eat too much, but if withheld from them for a time, they may possibly eat more than they should when it is again given to them. They seem to get the most from coarse-grained salt, which may be spread on the sills of the shed or put in small boxes used especially for it.

Rations for rams. — In feeding rams during the winter season, the object is to feed them as cheaply as possible and maintain their health and thrift. Oats and bran and oil meal may be relied on to meet all the requirements of a grain ration. A ram should receive one-half to one pound of this mixture, though the quality should be decided altogether by the condition of the ram. Clover hay, pea straw, or corn fodder are the best foods from which to select

the coarse portions of the ration. Some succulent fodder, such as silage or roots, should be fed so as to keep the ram from becoming constipated. From 2 to 3 pounds of coarse fodder will generally be found sufficient as a daily ration for a ram in addition to the grain before mentioned. A ration of this kind will usually keep a ram hearty, and if care is taken to give him sufficient exercise, no disorders are likely to result. Like bulls, rams are peculiarly subject to troubles of the urinary organs. Such ailments are especially frequent when mangels are fed. On some farms, mangels are used without any apparent injurious results. The likelihood of trouble renders it advisable to use these roots for rams with caution.

Lambs that are being wintered, whether ewes, rams, or wethers, require the same general conditions, shelter, and system of feeding as the ewes. The feeding needs to be more liberal, and the proportion of fattening feeds adapted to the object sought. The finishing of sheep for market is the topic of the eleventh chapter.

CHAPTER IX

SPRING MANAGEMENT OF THE FLOCK

It is advisable to divide the ewes into lots according to the time they are due to lamb. This will assist the shepherd in keeping informed as to the time of lambing, and also benefit the ewes. By putting the ewes that are in the same degree of pregnancy together, they are not so liable to be injured, and through divisions into small groups, there is likely to be less crowding at the feed boxes. This is a very critical period in the management of the flock, and every attention should be given to the care and comfort of the ewes. The most frequent causes of ewes casting their lambs originate from crowding about the feed boxes, pushing through narrow gate ways, jumping over gutters or deep ruts, and rough handling, especially in such operations as turning the ewes to trim their feet. It is when the ewes have passed through one-half the period of pregnancy that these things are most likely to cause them to cast their lambs. It is better to separate the ewes one week before they are actually due, rather than to delay this until their period of gestation has almost passed. The duration of pregnancy is almost invariably 147 days.

Indications of lambing. — Indications of lambing are noticeable several days before the event takes place. There is a marked dropping of the flanks accompanied by a swollen and red appearance of the vulva. Immediately preceding lambing, the ewe becomes restless and frequently changes her position.

Trimming and cleaning udders. — Previous to lambing, the udders of the ewes should be trimmed when necessary, thereby removing all wool that might be in the way of the lamb when it attempts to suck. By removing too much of the covering of the udder, inflammation may result from exposure. The udder should be cleaned if any filth has gathered on it, for such will often prevent the lamb from sucking the teat.

Delayed lambing. — In many instances, the ewe will pass the normal period of gestation two or three days; usually this is so when the lamb is of the male sex, though it may be due to something abnormal in the presentation or result from injury to the lamb. Unless the ewe strains as if in parturition, it is best to reserve any action. If she endeavors to lamb, an examination will usually disclose the cause of the delay.

Avoiding disturbance of the ewe. — Inexperienced shepherds invariably err in being too attentive to the ewe when lambing is about to take place. Unless there is evidence that something is wrong in the

presentation or condition of the fetus, the ewe should not be annoyed. She should be left quiet and unnoticed until straining begins.

Assistance in lambing. — Sufficient time should be given to the ewe to give birth to her lamb before an attempt is made to assist her. After straining a few times, the water bag is expelled and becomes ruptured, and the feet of the lamb then make their appearance. In most instances, especially when the presentation is right, a slight strain put upon these will bring a prompt delivery. In applying force to complete the delivery, carefulness should be observed only to do so when the ewe strains. If care is not taken to act in unison with the efforts of the ewe, some of the internal parts are likely to be injured or inflammation afterwards results.

Natural presentation. — Normal presentation occurs when the lamb makes its appearance with its front feet slightly forward of the nose, with the head between the fore legs. When in this position, it is easy for the ewe to expel the fetus unless it is too large. The lamb, when in a natural position, lies upon its belly.

Wrong presentations. — These may be due to natural causes, though they are often the result of accident. Insufficient accommodations at the feeding trough, or any other condition that is likely to cause the ewes to crush or push each other, will produce them. After a couple of hours have passed

since the ewe showed signs of lambing, an examination should be made to see how the lamb is placed. If it is in its proper position, then the ewe should be left to herself. When examination reveals the fact that assistance should be given, it should be rendered with prompt dispatch.

It frequently happens in cases of this kind that one or both of the fore legs are bent backwards. In the first instance, it is best to try and deliver the lamb while it is in that position by gently pulling downwards at the time when the ewe strains. If delivery cannot be secured in this way, the backward limb should be brought forward to its proper position.

When both fore legs are back and the head is presented, assistance must be given. It will be necessary to bring the legs forward, which can be accomplished after the head has been gently thrust back.

It is not an infrequent occurrence for the head to be slipped down between or on one side of the fore legs. With a little patience and gentle handling, the head can be raised to its natural position above the fore legs and the lamb easily withdrawn. The head is sometimes presented, but there is no appearance of the feet. When this occurs, the head should be forced back far enough to allow the hand sufficient room in the vagina. Then feel for the fore legs, draw them forward together, and attach a loop of soft cord to each of them and allow them to recede.

Then secure the head and bring it forward, into the cavity of the pelvis by grasping the whole head with the hand. If there is not sufficient room for doing this, put a loop of the cord around the lower jaw of the fetus and pull gently, being careful not to injure the jaw by too much pressure or force. Then by the strings draw the feet forward, and the lamb may easily be extracted. The feet sometimes appear, but the head is not to be seen. In such an instance force the feet back into the vagina and proceed as in the last case.

When parts of two lambs are presented at the same time, push both back. First put one lamb in proper position, then draw it away, and usually the other one will be easily extracted.

Broadside presentations are unusual occurrences. The side of the lamb is found obstructing the uterus. To place the fetus in its proper position it is advisable to turn the ewe on her back and gently raise her from the ground by the hind legs. In this way the fetus falls forward, and when the hand is introduced, it is easy to adjust it properly.

Sometimes the fetus is on its back; then the treatment should be the same as in the last instance. The lamb may be too large for the passage, which may result in the loss of the lamb or the ewe. To save the ewe, it may be necessary to use a knife to dissect the lamb. This is most easily done by severing the shoulders from the body.

A breech presentation occurs when the hind legs are first presented. Usually it is not advisable to attempt the delivery of a lamb in that position without trying to turn it. When an instance of this occurs, the delivery should be hastened, otherwise suffocation may result.

Another form of breech presentation is one in which the hind legs appear at the opening of the womb and are bent backwards. Place the ewe on her back; let an assistant stride across her, facing the hinder parts, and holding the hind quarters as high as possible by taking a firm grasp of the leg between the thick of the leg and the hock. When the ewe is in this position, gently insert the hand into the passage until the lamb is reached. Pass the hand from the rump of the lamb to the thighs, and by taking hold of the legs as near the foot as possible, draw it forward into proper position. When the same is accomplished with the other leg, it is easy to secure delivery. Monstrosities are sometimes the cause of trouble. As a rule, they cannot be removed without the use of a knife.

In handling ewes with awkward presentations, roughness and hurry should be avoided. The hand should be anointed with fresh lard and oil, and the finger nails trimmed short. After the ewe has experienced difficult labor, the parts should be soothed with carbolized oil, or a solution of creolin, one to fifty parts water, may be used to allay the inflammation.

Still-born lambs. — When a ewe has been carrying dead lambs for some time, her head droops and her eye has a dull appearance; she seems feverish and refuses food, and there is a watery discharge attended by a very offensive smell. Everything is in an unnatural state, and the lamb is very much swollen. When it is taken away, it is usually wrapped in a putrid and offensive fetal covering. In all cases where the delivery has been difficult or when dead lambs have been removed, the conditions are favorable for the ewe to be attacked by inflammation. With a view to checking this, a small quantity of carbolized oil or the creolin solution should be injected into the womb, and two drachms of laudanum given internally with two spoonfuls of linseed oil. This should be repeated if the inflammation does not subside. It is advisable to remove from the rest of the flock such ewes as have had dead lambs. Feed them carefully, and in severe cases it will be well to let them have oatmeal or flaxseed gruel three times a day, made with a pint of warm milk. Do not allow such ewes to drink much cold water.

After treating ewes with this trouble, the shepherd should be careful to wash and disinfect his hands in a two per cent solution of carbolic acid or the creolin solution.

Removal of the after-birth. — When the delivery has been normal, the after-birth or placenta generally comes away with or shortly after the lamb. In

some cases, it may remain for a day. In such instances, it should be removed before it begins to putrefy, and the passage treated with creolin solution. The after-birth should never be left in the pen where the ewe has lambed.

Possibility of a second lamb. — In instances of twins, the arrival of the second lamb is sometimes delayed. The ewe becomes so engrossed in the care of the first lamb that she becomes unmindful of the continued pains of labor. If the second lamb is in proper position, it is not long in making its appearance. When this occurs, it should be at once brought to the notice of the ewe by placing it in front of her. This guards against any possibility of the ewe disowning this lamb.

Assisting the lamb. — After the ewe has cleansed and dried the lamb, and it has rested a half hour or so, it should be assisted to suck, if it is not able to do this of its own accord. In the case of young ewes, this must be attended to, as the anxiety on their part to keep the lamb in sight prevents the lamb sucking. The ewe should be held and the lamb brought to the teat, the wax being previously squeezed out.

Attention at birth. — As soon as the lamb is born, clean the mucus from its nostrils and mouth. It is customary to blow into the nostrils of the lamb to assist it in breathing. Bring the lamb before the ewe and leave them for a period of twenty minutes or so. Let her have time to clean and dry it. If

she is backward in attending to this, sprinkle a pinch of salt over the lamb. A lamb of ordinary strength will at once seek its mother's milk; but if it is weak, it must be assisted.

Marking the lambs. — The most common method of recording the parentage of lambs is to number them while only a few days old by a system of notches in the ear. Tags in the ears of young lambs are likely to tear out. The notches afford a permanent mark, though most associations that record pure-bred sheep require the use of the label bearing the official number after the lamb is recorded. This official label can be inserted at weaning time, when there is small danger of its being torn out, and the official number recorded along with the flock number indicated by the notches. A system of notches can be made to cover several thousand. Such a number would serve most flocks for several years. The lower numbers are most commonly used, and along with the year of birth. The breeder's name, the flock number, and the year make up the individual designations mainly used in registration: thus, Johnson 176—1910. A separate mark to indicate the year may be given each lamb of a season, but this is not likely to be needed. Until four years of age the teeth are sufficient guide as to the year of birth, and if older ewes are too numerous to be remembered, the official number and flock book furnish identification. These notches can be made with the punch

used for labels, but only the corner should be used, as a large notch in a young lamb's ear becomes a disfiguration later.

The system of notching is based on the numbers one, three, and nine.

One is — one notch at base of right ear on lower side.

Two — two notches at base of right ear on lower side.

Three — one notch at tip of right ear.

Four — one notch at base and one at tip of lower side of right ear.

Five — a combination of two and three.

Six — two notches at tip of right ear, lower side.

Seven — one notch at base and two at tip of right ear, lower side.

Eight — five and three combined.

Nine — one notch in middle of lower side of right ear.

Similar marks in the left ear have a value of ten each. One hundred is made by a notch in the upper side of the left ear. Three hundred would be shown by a notch at the tip of the upper side of the left ear. Each notch in the upper side of the left ear counts one hundred, and the number of hundreds is shown by the same positions and combinations for units in the lower side of the right ear. Correspondingly, each notch in the upper side of the left ear represents one thousand.

Weak lambs. — Warmth is one of the best stimulants to use when the lamb is weak. The quarters should supply this as far as possible. It is a good plan to warm weak lambs by wrapping them in thick woolen cloths that have been warmed on a stove. As soon as one wrapper becomes cool, another hot from the stove should succeed it. This is a much more effective way than dipping the lamb in hot water, which is sometimes recommended. If the lamb is not extremely weak, it may only be required to feed it some of its dam's milk with a spoon. If it does not gain strength by frequent feeding of the milk and keeping it warm, a stimulant such as whisky will be required. A weak lamb should not be exhausted with efforts to hold it to the teat and make it suck. It should be assisted gently and carefully to do so. In most instances, it will be only necessary to hold the lamb to the teat, and then, putting a finger in its mouth, it is easy to start it sucking by substituting the teat. It should be helped in this way four or five times in an hour until it gains some strength. Unless the lamb is very weak, it is not advisable to turn the ewe on her back for it. For three days it is advisable to keep the ewe and the lamb by themselves. This is beneficial, as they become acquainted with each other, and the lamb grows strong enough to take care of itself before being put with the others.

The division of ewes and lambs. — As the lambing

proceeds, the ewes and their lambs ought to be classed into several groups. One yard is required for the ewes that are heavy in lamb, another for the ewes that have single lambs, and a third for the ewes that have twins. By having them divided in this way, they may be given better attention and feeding.

Dry ewes. — It sometimes occurs that the ewes have no milk for their lambs. This is generally the result of insufficient feeding, though it sometimes happens with ewes that are in thrifty condition. To stimulate the secretion, there is nothing better than the feeding of such foods as bran or oats a month previous to lambing. As a quick stimulant, the feeding of oatmeal gruel or wheat-flour gruel is the most satisfactory.

Treatment of unkindly ewes. — When a ewe will not allow her lamb to suck, she should be held to permit the lamb to get milk when it needs it, or, if time cannot be taken for this, a halter should be made for her and she should be tied so that she cannot butt it. It is well to make an examination of the udder, for it may be that inflammation in that region is the cause of the trouble. A ewe may not wish to own her lamb. Such dislike for the lamb disappears if they are kept together in a pen for a few days before being out with the others.

Care of twins. — If the ewe is a good milker and the lambs are hearty, twins do not give any more trouble than single lambs. In the event of a ewe

having twins and a small quantity of milk, it would be well to transfer one of the lambs to a ewe that has only one lamb and a bountiful supply of milk. If two ewes lamb at the same time, it is a very easy matter to make the transfer by rubbing the lambs together so that they may have the same smell. It is necessary to note that both of the lambs in the instance of twins have their share of the ewe's milk. When the lambs are young, if one of them is somewhat stronger than the other, it is likely to obtain more than its portion. To obviate this, the ewe should be held at times for the weaker lamb.

Hand-feeding lambs. — In raising lambs that have lost their dams, it is best to feed them cow's milk from a bottle that has a small rubber nipple attached to it. A newly dropped lamb only requires two teaspoonfuls at a time given every hour. The milk should be fresh from the cow, at a natural temperature. The lamb should be fed a small quantity, and that at frequent intervals. It is not necessary to sweeten the milk nor weaken it with water. Lambs may be taught to drink from a dipper by introducing the rim of it into their mouths and allowing them to drink in the customary manner. But the best plan is to feed them from a bottle with a rubber nipple. Lambs will make good growth on milk, provided that they are fed regularly and only small quantities are given them frequently. At times, the lambs reared in this manner are troubled with scours; in such

cases the milk should be boiled for a few meals. A teaspoonful or more of limewater should also be given in the milk. If this should fail, add a teaspoonful of castor oil to the milk as often as may be deemed necessary.

Foster mothers. — Among the different ways on inducing a ewe to own a strange lamb, the most common is to cover the lamb with the skin of the dead one. Another efficient means of deception is to rub some of the milk of the ewe over the lamb. The age of the lamb that is to be substituted should be nearly the same as that of the lamb that died, so that it may not be injuriously affected by the condition of the ewe's milk. If the ewe has recently lambed and the lamb substituted is several weeks old, scouring will follow.

Feeding grain to lambs. — It is advisable to feed grain to lambs as soon as they begin to eat. If the ewes are fed grain from a low trough, the lambs will begin to eat some with their dams before they are two weeks old. As soon as they begin to do this, a part of the pen should be set apart as a feeding place for them. Shortly after lambing and before the ewes are put on pasture, it pays to feed them grain, but the best results in the growth of the lambs will be attained by feeding direct to the lambs.

If the lambs are in the field, a sheltered place where the flock may be in the habit of gathering should be

selected, and a small pen or creep may be constructed for them.

Food previous to weaning.—For feeding lambs that are to be used for breeding purposes, the writer has a preference for bran and oil meal. They will make more growth on this than they would if corn meal were added to the mixture. The latter would make them fleshier, but would not produce frame to the same extent as the other foods do. Oats are wholesome, but the lambs will do better on them after they have been weaned. In feeding lambs, the aim should be to give them all the food they have the capacity to consume without gorging them. That implies frequent feeding in small quantities. The details in feeding young lambs are as follows: In the morning at six o'clock they are fed a small quantity of grain in the trough. After the other sheep are fed, it is noted if the lambs have eaten the grain that was given them, and if so, more is put into the trough. At noon, they receive another allowance. In the evening, they are fed twice in the same way as in the morning, and they are left at night with some grain in their troughs.

Quantity of grain to feed.—At first lambs will take but a small quantity of grain, but as soon as a few of them come to the trough at your call, the others soon follow and the grain is eagerly eaten. The best guide as to the quantity to feed is the judgment of the feeder. Liberal feeding is the source of liberal

growth. It is possible to overforce lambs by injudicious feeding with such foods as corn meal, but it is seldom that this results from feeding an equal mixture of bran and oil meal. When the lambs have reached the age of one month, they will eat and use to advantage one-half pound daily of this latter mixture.

Feeding ewes that are suckling lambs. — If the ewes are in the shed when they are suckling their lambs, it will pay to feed them with such foods as bran and oats. When the ewes are on good pasture, no advantage results from feeding the ewes grain. In an experiment with forty ewes and fifty-six lambs, the writer found that the lambs did not make a greater gain through feeding their dams grain when on pasture. The sheep were divided into four lots, with ten ewes and their fourteen lambs in each. In two of the lots, the lambs were fed grain, and the ewes grain and no grain. In the other two lots, the lambs were fed no grain, and the ewes grain and no grain, respectively. The following statement will make the difference in the feeding clear: —

Lot I. Ewes fed grain; lambs fed grain.
Lot II. Ewes no grain; lambs fed grain.
Lot III. Ewes fed grain; lambs no grain.
Lot IV. Ewes no grain; lambs no grain.

The ewes in lot I ate 441 pounds of grain, and their lambs ate 443.5 pounds of the same mixture. In lot II, where the ewes did not receive any grain,

the lambs ate 488.75 pounds of grain, and they gained 18.5 pounds more than the lambs of lot I, that, during ten weeks, gained 432.25 pounds. The only compensation for the feeding of the grain to the ewes was in the fact that those receiving grain lost in weight only the total of 80.9 pounds, while those in lot II lost a total of 111 pounds in ten weeks. The only difference in the feeding of lots III and IV lies in the management of the ewes. The ewes of lot III ate 583 pounds of grain and the lambs without grain made exactly the same gain and their dams had no grain. The grain fed to these sheep consisted of a mixture of one part oil meal and three parts bran during the first three weeks of the experiment, and one part crushed corn, one part oil meal, and two parts bran during the last seven weeks of the experiment. In addition to this, they had excellent pasturage.

The ewes that are suckling lambs should have 3 or 4 pounds of roots or silage as a part of their ration. Either of these will stimulate the flow of milk. Sweet and clean clover hay should be given them. The finer it is in the stalk and the more heads it contains, the better they like it.

Castration of lambs. — The safest method of castration is best performed when the lamb is one to two weeks old. If attempted before this time, the testicles will be found to be small and soft, and as a result difficult to remove. Two persons are re-

quired. One should hold the lamb tightly by gathering the four legs together and pressing the lamb tightly against his body. The operator taking hold of the scrotum and pulling the skin free from the testicles cuts it straight across about an inch from the body of the lamb. The testicles will then protrude. It will be noticed that there will be a constriction near the end of the testicle. If this is slit, the testicle at once springs free of the covering, and it is easily removed by pulling it out after the slight attachment remaining at the end has been loosened. As much of the cord should be taken away as can be removed by pulling it. When the lambs are young and the testicle small, it should be drawn from the lamb without attempting to remove the outer covering. The scrotum should be left open so that festering may not occur. The lambs that are treated should be kept in a dry place for two days. If inflammation sets in and pus forms and the lamb becomes still worse, the part should be dressed with lard, the scrotum opened and the material that has collected pressed out, and the parts washed with an antiseptic solution such as that made with one part of creolin to fifty of water. A different method from those described is sometimes adopted: the testicles are pressed forward by the left hand to the front of the scrotum, and two cuts are made opposite the testicle, and through those the testicles are then drawn out. This method is objectionable, as the cut heals

so rapidly that if suppuration begins, there is no outlet for the pus that collects, and as a consequence inflammation follows. It is necessary to be careful to remove both of the testicles intact, for if this is not done, such a lamb will prove troublesome when being fattened with others.

Docking the lambs. — The easiest and most agreeable way of docking is to have the lamb held in a manner similar to that desirable for castration, and when in that position, the tail is cut off with a sharp knife one inch or less from the body. It will be observed that it is at that distance that the skin of the body on the under side merges into the tail. It is advisable to do this as soon as the lambs have recovered from the effects of castration or in the instance of ewe lambs when they are a week or so old, for the reason that the tail thickens as they grow older and it becomes harder to locate a joint. If done when the lamb is not more than a week old, it will not suffer from the loss of blood. When lambs over six months old are to be docked, there will be a smaller loss of blood if a string is tightly tied just above the joint at which the tail is to be cut. If the lambs are in ordinary condition and not likely to become weak from the loss of a small quantity of blood, they may be docked similarly to the method described for younger lambs. Rather than dock lambs in the hot season when flies are numerous, it would be better to let them go until the cooler days in the fall.

CHAPTER X

SUMMER MANAGEMENT OF THE FLOCK

During the summer months, the flock is too often completely neglected after the shearing has been accomplished. As a rule, the sheep are allowed to run in some large field where water is available to them, and they are left entirely to themselves during this season. While it is a time during which the sheep are well prepared to care for themselves, yet there are a few details requiring attention that add greatly to their thrift and comfort.

Ordinarily all the ewes with lambs may run in one lot after turning to pasture. Ewes not having produced lambs are usually disposed of before summer. Ewes having lost their lambs and which it is desired to retain to breed again may run with the nursing ewes, but if the size of the flock justifies two divisions, such as dry ewes may run with the yearlings, and if these are well wintered, a fair pasture will carry them into the fall in good shape. The possibility of the ewes breeding during summer renders it unadvisable to leave the ram with the main flock. He will usually be contented in a separate lot until fall, but if not, one or two other sheep with him will insure quietude.

Salt and sulphur. — It is advisable to have places in the pasture or under shelter where the sheep may secure salt and sulphur at any time. This is probably the best time to feed the sheep sulphur, as they are less liable at this season to contract colds from eating much sulphur. In the spring and winter, there is a likelihood of contracting colds from eating it, but this is not likely to occur during the summer months. Rock salt may be used, but ordinary coarse salt is generally preferred. The sulphur should be mixed with the salt in sufficient quantities to give it a slight yellowish tinge. When the salt is fed in a granular form, the sheep will eat more of it than if it is given them in the rock condition. The salt should be before them at all times. If it is only given them at rare intervals, they are apt to take too much when they have access to it. The plan followed by some shepherds is to scatter salt around the weeds in the sheep pasture to induce the sheep to eat out the weeds.

Fresh water required. — While sheep possess the ability to do without water with less annoyance than other classes of stock, yet it certainly adds to their comfort and health to have access to pure, fresh water at all times. Especially is this true during the hot, dry months of July and August. If there is not any running water in the pasture, they should be allowed to obtain well water at least once a day.

Pasturing horses with sheep. — It is most unadvisable to pasture horses in the same field with the

breeding flock. There are times when the horses feel inclined to rush about, and at such times some of the sheep are almost certain to be injured.

Application of tar. — During the hot, dry season when the flies torment the sheep a great deal, it is advisable to coat the nostrils of all the sheep with pine tar. The best plan is to warm the tar until it becomes fluid, and then, with a stick that has a small piece of cloth wound around it, apply the tar to the nostrils. This wards off the attacks of the gadfly. This fly deposits the larva or living worm in the nostrils of the sheep; in a short time, the larva passes up the nostrils and lodges in the nasal sinuses. During the winter it develops, and the irritation that it causes produces the running at the nose, which is common among so many flocks in the winter season. The larva when developed is expelled by the sneezing of the sheep, especially when grain feed is given dry. It goes into the manure, then into the chrysalis state, and finally emerges in June or July as a mature fly.

Shade in pastures. — During the summer season, the sheep should have some shade in their pastures. If they have access to a small grove of trees, this is all that is needed, but where they cannot have this, a cheap shelter may easily be constructed by means of boards. During the hot season, it will be noticed that the sheep feed mostly in the morning and in the evening, while in the intervening time they are lying down in the shade chewing their cuds. The

feature of this season that seems to affect the sheep most is the burning noonday heat, and if they have any access to shelter under trees or cheaply constructed sheds, they suffer no annoyance. The gadfly is generally busiest just before sunset.

Changing the pastures. — Instead of giving the flock the run of a very large pasture, better results can be obtained by limiting them to a small acreage at different times. They like a change, and by arranging the pasture into fields of fair size, the pasturage may be better maintained. In a large pasture, the sheep form the habit of grazing in certain places, and these they will eat very close, while neglecting the rest, as soon as they have access to these places that seem to suit them best. Grazing in its native habitat, the sheep roams over considerable territory, and under farm conditions is benefited by frequent changes more than is any other farm stock. Where permanent pastures are the sole reliance, there is danger in all the central and eastern states from the stomach worm. The eggs are left on the ground by infected sheep and taken in by the lambs when grazing. The infection is seldom troublesome to the ewes.

Guarding against worms. — Infection of the lambs is to be avoided by allowing them to graze only on ground that has been cultivated since having been passed over by infected animals. When this is not convenient, recourse is sometimes had to the plan of keeping

the lambs all the time in the shed and bare lots, where there is no means of the eggs being taken in. The ewes run on the pastures and come in to nurse the lambs two or three times each day. By feeding the lamb a tempting grain ration, little trouble is experienced in separating them when the ewes are to return to the pasture. Such lambs can be fed to carry along as fast as desired and can be weaned without serious setback, and in the fall can be run upon forage crops sown in summer upon fresh untainted ground. This plan requires considerable attention to the flock, but has worked successfully.

Summer grazing crops. — It is likely to be more satisfactory to go a step farther and provide a rotation of grazing crops to carry the ewes and lambs from the first of the season until weaning. After that, the ewes can go on old grass land and the lambs to freshly seeded land or to other green crops. This is the plan of summer keep on British farms that are stocked very heavily with sheep. As well as insuring continued thrift for the lambs, it requires a much smaller acreage than is needed if only grass is used. It involves some extra labor in preparing the ground and seeding at frequent intervals to insure a succession of fresh grazing, but it is only by this plan that intensive farming with sheep is likely to be really profitable. As an offset to the crop sowing and moving of the sheep, allowance must be made for the economy in having the crop harvested without labor. The plan is not

likely to be practical unless the flock is of sufficient size to justify its having the first call upon the time of one man even during the summer. It is the smaller flocks that stand as a side issue and are turned into a regular pasture from spring until fall that become unhealthy and unprofitable.

To secure the greatest use of the grazing crop, the English shepherd sets light hurdles to confine the flock to a small area until it is closely eaten. These are advanced as necessary, and narrow openings allow the lambs to run through to the new ground ahead of the ewes. They may be fed grain here, also, if it is desired to finish them quickly.

It is possible to carry a flock from spring until winter upon sown crops. One piece of land sown to rye will furnish fall and spring pasture and can be reseeded to furnish oats and peas later or a fall crop of rape. Early sown oats or oats and field peas can be ready after the rye is gone, and a new clover field may be used before the second crop is ready. Spring and summer pasture is sometimes furnished by a stand of clover seeded at the end of cultivation of a corn crop. Rape sown with small grains furnishes good fall pasture in some seasons. There is a danger of its making growth enough to be troublesome in the grain harvest. The same crop can be sown between the corn rows, or it can be grown separately for earlier feeding. Early sown rape is ordinarily ready for grazing two months after it comes up.

By seeding small pieces at different dates, a succession of crops can be secured to furnish feed for a long period. The most satisfactory results from the use of rape are secured when it is seeded on well-prepared rich ground. On most soils it does as well drilled in rows 30 inches apart on the flat at the rate of 2 pounds per acre as when planted on ridges. Grown in rows, the soil can be kept stirred and a large crop secured; also there is less waste than there is in grazing the crop sown broadcast. A good stand of rape well grown has been shown at the Wisconsin Experiment Station to be sufficient to carry twenty lambs for two months on one acre. These lambs were also on a medium grain ration. For ewes with lambs two or three months old, neither receiving grain, it would be well to plan at the rate of an acre per month for twenty-five head of ewes and lambs combined.

If it is desired to cut the crop for feeding, it should be cut about 4 inches from the ground. When cut at this height, or when it is not grazed too closely and the weather is not very dry, it will make a growth to furnish considerable feed from the second crop. Some care is necessary in getting sheep accustomed to rape. It is not safe to give free access to it when coming from a short pasture, and they should not be turned into it at first without having their stomachs partly filled from some other pasture.

Oats, peas, and vetches are other crops that can

FIG. 37. — (Page 215.)

FIG. 38. — (Page 215.)

PLATE XV. SHEARING THE SHEEP.

The shearer often uses his free hand to draw the skin tight under the clipper, as shown in Figs. 40 (Pl. XVI) and 46 (Pl. XIX).

be used to maintain the supply of summer feed. Cabbage affords a large amount of the best of feed, and when it can be raised and fed in a suitable place, is a very valuable feed.

Alfalfa is one of the most valuable forage crops. It can be used to carry sheep all through the season or for use when none of the other crops is ready. If it is to be used as one of several crops for such use, it is likely to be much more satisfactory to cut it and feed it green on other ground. By carefully getting sheep accustomed to running on alfalfa and having a clean pasture to use in conjunction with it, some flockmasters get along with little loss. This, however, is when it is used for some length of time, and not when the sheep are being changed from one crop to another.

Weaning. — There is considerable variation in the ages at which lambs are weaned, but at four months of age is the standard time. It is not often considered necessary to take out the older ones first, though if some of the lambs are much younger than the others, it may be advisable to leave them with their dams after the older ones are weaned. With good fall management to insure a short lambing season, the lambs are all ready for weaning at the same time and the ewes uniformly prepared for breeding and another short lambing time. Weaning may be done at ten or twelve weeks, though such is possible only when there is plenty of good green feed available

for the lambs. If, when the lambs are this age, it is not convenient for them to have access to grass land uninfected with stomach worms, part of each day, when rape or alfalfa is furnishing the grazing, they can be weaned, and the ewes alone allowed to use the old pastures that are scanty or unsafe for lambs. The lambs can then be given some grain feed or furnished cut forage the first part of the day, to insure against bloating when on the other crops.

Lambs dropped in February can be made to weigh 60 pounds in May and, at the price usually obtainable up to that time, bring more than if carried to greater weights and sold later in the season. The earlier they can be made heavy and fat enough to market, the greater the advantage, and grain feeding at this time is always well repaid.

When lambs are marketed at around three months of age or separated from the ewes for other reasons at that age, there is more danger of trouble with the ewes than when they are kept in milk a longer time. Under the English system of hurdling on grazing crops and letting the lambs run ahead of the ewes, weaning can be done gradually with advantage to both the lambs and their mothers. The lambs have their grain trough in the fresh grazing in front of the hurdles that keep the ewes back. While the lambs are in front, the ewes are removed to shorter and drier pasture. The length of time away is increased each day. With the shorter and drier

Fig. 39. — (Page 215.)

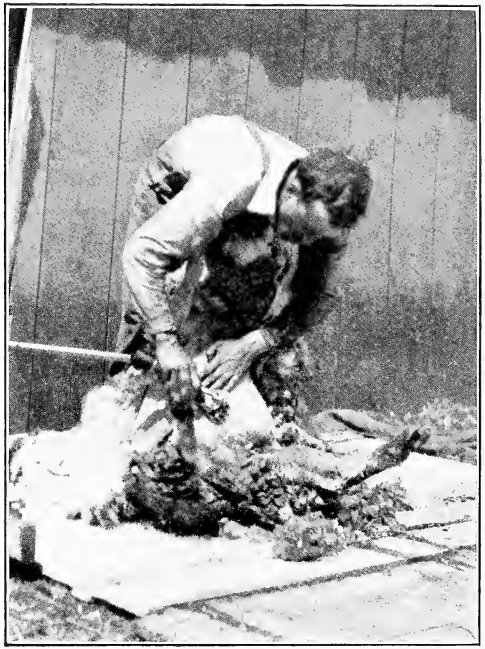


Fig. 40. — (Page 215.)

Plate XVI. Shearing the Sheep — *Continued.*

feed, the milk supply is diminished and the lambs take more feed and experience minimum effects from the change.

Whether separated abruptly or gradually, special provision should be made to have the lambs feeding well. When this is done and the lambs remain in the place they are accustomed to while the ewes are removed out of their hearing, there need be but slight interruption to growth.

In any case, the ewes need to be kept on shorter feed to check the milk flow. Hand-milking of some ewes is sometimes necessary to prevent spoiled udders. Pasture suitable for ewes being dried up is not ordinarily hard to obtain in July or August. If the lambs are weaned early, the ewes have a good deal of time in which they are not producers, and the pastures can be stocked heavily to keep down the cost of carrying them. Considerable feed is generally furnished by the waste in small grain fields, and as breeding time approaches better feeding is necessary.

Lambs that are to be fattened in winter will probably not require grain feeding when weaned, but that will depend upon the other feed they are receiving. At that age they make the fullest use of feed and grow more economically than they can when they are older. They can be kept doing well on rape and clover until winter, with grain or good hay furnished as the season advances, so that when taken

to winter quarters, they are accustomed to the feeds that must be used there.

Ewe lambs to be kept for breeders will do well enough under the same treatment until the finishing for market is begun. If ram lambs are kept, they may run with the ewe lambs some weeks after weaning, but it is preferable that they should be separated at the same time. Whether to be sold as lambs or carried into yearling form, the rams require grain through the fall to secure full development, without which rams of any age are poor sellers.

Time for shearing. — Shearing may be discussed as a part of either spring or summer management. The time at which it may best be done depends upon location, housing facilities, and time of lambing for breeding ewes. There may be actual losses or serious setbacks for some sheep if the wool is removed early and warm quarters not provided. Fattening sheep thrive especially well when relieved of their fleeces and can be penned more closely so that there is no particular expense or difficulty in affording necessary warmth and shelter. Wooled sheep usually sell on the market at a price that takes into account the value of the fleece on the basis of the wool market at the time. If one prefers to wait for a change in the wool market, he should shear before shipping. There is another advantage in that a greater number of shorn sheep than of wooled ones can be shipped in a car.

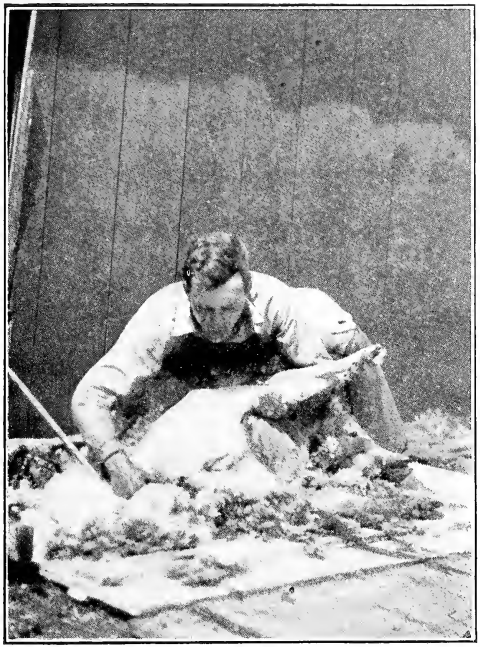


FIG. 41. — (Page 215.)

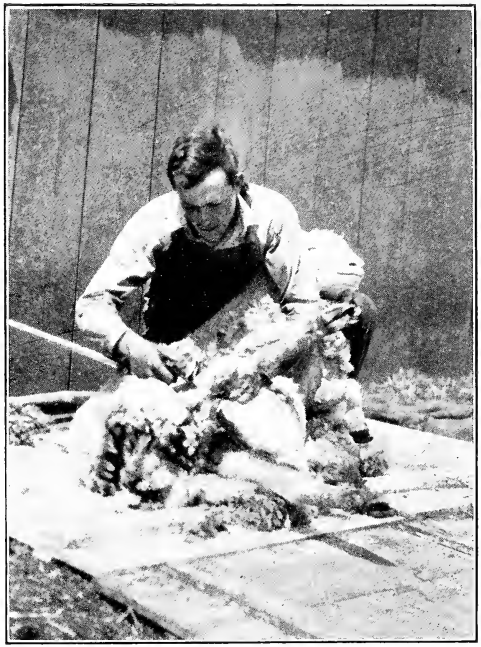


FIG. 42. — (Page 215.)

PLATE XVII. SHEARING THE SHEEP — *Continued.*

There is not much relation between time of shearing and quality of wool except as the sheep may be in a poorer or better condition at a later time. Breeding ewes are likely to yield sounder and evener fleeces before lambing time. After the usual lambing time, however, the fleece will be of greater length and weight, and the oil more abundant in warmer weather. Abundant oil or yolk gives added weight to a fleece, but no greater actual value. In farming sections, small lots of wool are generally bought at a flat rate, and the actual value on a scoured basis not computed by the buyer, as is done when large lots are appraised.

Sheep shorn both in the spring and fall produce a greater weight of wool than if shorn but once, but the shorter staple has a lower value and there is no real gain. When the summer wool gathers more dirt and foreign matter than does the winter growth, fall shearing gives a short but cleaner and more valuable spring clip, which is not deteriorated by having in it the foreign matter of the fall clip. This applies in sections of dry summers and mild winter seasons.

Manner of shearing. — The things to be aimed at in removing the fleece are quiet and quick work, to avoid injury to the sheep, and keeping the fleece in an attractive form. Careless shearers allow the fleece to be torn apart by the struggling of the sheep, and what are called second cuts greatly impair the

marketable value of wool. Second cuts are the result of not cutting close to the body. At one part of the stroke of the shears or clippers, cutting is done close to the skin, while at the other end of the stroke the blades are cutting so as to leave a quarter or a half inch of wool next to the skin. This makes a shorter staple at such places, and if, as often happens, the shearer returns and clips the short wool previously run over, that part has a low value because of its insufficient length to be used in the factory along with the rest of the fleece.

Washing before shearing. — The custom of washing before shearing is now practically obsolete. Careful washing does remove dirt and gives a cleaner wool. At the same time the oil is removed, though if ten days of warm weather intervene between washing and shearing, the fleece will have its normal weight. Nowadays shearing is usually done too early in the season to permit of washing sheep with safety, and it is much better to prevent dirt and chaff from getting into the wool in the first place, by being careful in feeding and bedding and having properly constructed feed racks.

Place for shearing. — Shearing should be done on a platform of sufficient size to prevent the shorn wool from getting into the dirt, or about 10 feet square. The floor of a barn is a suitable place, as far as keeping the wool clean is concerned. The shearing platform should be kept swept, and as each

sheep is brought on and turned up for shearing, all straw and dirt adhering should be removed. Most buyers will make it to the advantage of the wool-grower to separate the tags or dung locks and sell them separately so that no allowance need be made for them in estimating the value of the fleeces.

The shearing machine has almost altogether superseded the hand shears. It is much easier for the shearer and, except on very wrinkly or heavy folded Merinos, is much faster. Machine shearing also makes it possible to cut closer to the skin and thus get more wool as well as having a smoother looking sheep than is turned out by any but the most careful hand shearers. The hand-power machine is not expensive and unless more than 100 sheep are kept, a power machine is not likely to be economical, though it is wholly practical for a number of sheep owners to combine in buying a power shearing outfit for their joint use and perhaps for shearing for other owners.

The accompanying figures (Figs. 37–47, Pls. XV–XX) show one expert's way of taking off a fleece and his way of handling his sheep. There is great variation in the way good shearers commence on a sheep and in the way they go from one part of the body to the other. The system shown in the illustrations leaves the fleece in good condition and calls for a minimum of handling of the sheep.

Tying the fleece. — Special types of boxes were

once in use for rolling and tying fleeces in a very attractive form. The market now prefers a fleece tied more loosely (Fig. 48, Pl. XX). A neat job may be made by spreading the fleece on the floor, flesh side down, then folding the sides in and rolling from neck to other end and tying firmly with hard, smooth twine wrapped around once each way and tied securely. Sisal or any other twine from which fibers get into the wool is very objectionable. These vegetable fibers cannot be separated from the wool, and being of a different nature do not absorb dyes, and this makes it impossible to use wool tied with such twine except for cheap fabrics in which the uncolored fibers are not so seriously objectionable. The harder twines are likely to come untied and allow the fleece to fall apart. There are twines made of paper especially for tying wool; "India" three-ply, size No. $4\frac{1}{2}$, is well adapted for the purpose.

Wool can be stored with very small probability of deterioration or loss of weight. Any place that is clean and dry is suitable for storing, and even if stored for but a short time, it is best to pack the fleeces in the regular sacks made for the purpose.

Dipping. — Ordinarily, sheep require dipping at least once a year, and twice is often necessary. For scab or other diseases more frequent, special dipping may be needed, as discussed in Chapter XV. It is seldom safe to forego dipping the entire flock shortly after shearing. At this time, most of the ticks are

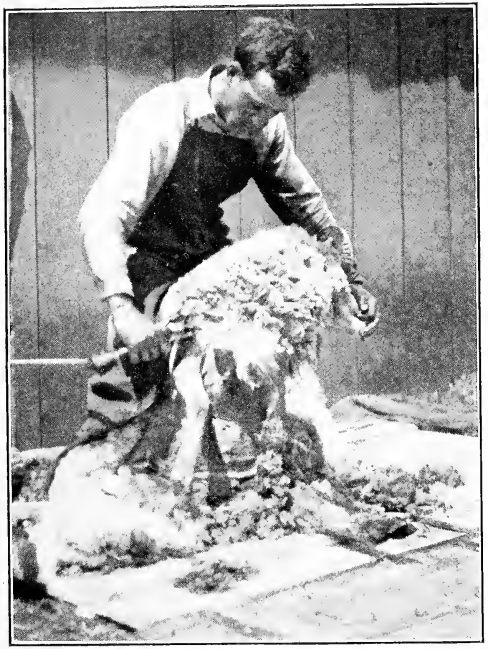


FIG. 43. — (Page 215.)

FIG. 44. — (Page 215.)

PLATE XVIII. SHEARING THE SHEEP — *Continued.*

on the lambs and are a handicap and annoyance to them. Less dip is required when the older sheep are short of wool. With lambs less than three weeks old, there is a danger of disowning by their mothers on account of the dip destroying the scent by which the lamb is recognized. If this happens, the lamb is not allowed to suck, and some trouble is necessary to effect a reconciliation. Unless the flock is wholly free from ticks, a fall dipping is desirable. This should be done before the weather is cold enough to render the sheep liable to cold.

Lambs can be easily dipped in a barrel. A wide trough may be utilized for larger sheep, but care and patience must be exercised to make sure that the dip reaches all parts of the body.

A swimming-bath of the following dimensions will be found most suitable for a flock of several hundred; it can either be made of pine boarding lined with zinc or of concrete. Let the length of tank be 20 feet, and 2 feet wide at top, narrowing to 1 foot at bottom. The tank is 5 feet deep at one end, the depth extending to one-third of its length. The bottom then stands up from this point to the top of the end; it is on this slope that the sheep leave the vat, and ought to be battened every 6 or 8 inches, so as to make egress easy for the sheep into the dripper. A pen to hold the required number of sheep for dipping is built at the deep end of the tank, with the floor raised 2 feet, forming a drop

into the tank by means of an opening in the side next it, and about the same width. At the other end is the dripper of the same size as that made for holding the sheep before dipping. Its floor must be sloping, so that the dip coming from the sheep will drain back into the tank.

Fig. 46. — (Page 215.)

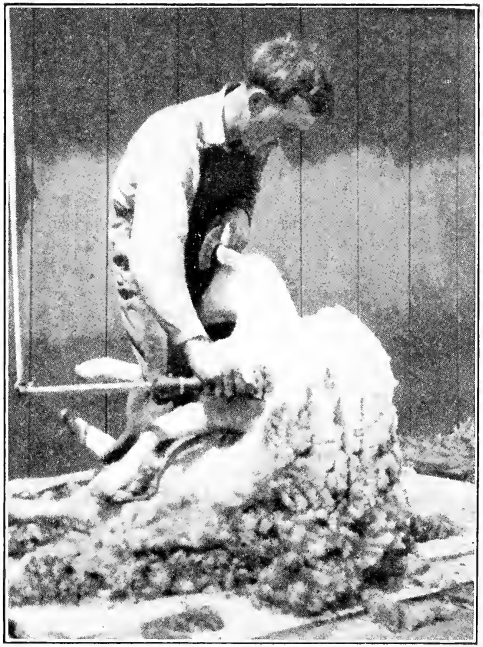


Fig. 45. — (Page 215.)

Plate XIX. Shearing the Sheep — *Continued.*

CHAPTER XI

WOOL

Breeders of fine-wool sheep study the fleeces of their animals almost to the exclusion of attention to carcass points. Raisers of mutton sheep cannot afford to neglect the wool-bearing qualities of their sheep. A good deal can be done to increase the amount and value of the wool produced by mutton sheep without impairing their usefulness as meat producers. In addition to this, certain qualities of the fleece are associated with general health and vigor and adaptability to farm conditions. One of the most important requirements in any fleece is density.

Density. — The density of the fleece means the closeness of the fibers. Technically it means the number of fibers that grow on a square inch. Density is not only of value to secure a heavy fleece, but from a breeder's point of view, its chief importance lies in the fact that it is more protection to the sheep than a fleece that is open. Not only is a sheep with a loose, open fleece more liable to contract cold from exposure to rain or wind, but it is also more apt to yield a dirty fleece, as the loose fleece catches the dirt and dust and pieces of hay and straw. From

the shepherd's point of view, the denseness of the fleece is its leading feature, for it will be found that those animals with dense, close fleeces are less subject to such diseases as catarrh, running at the nose, or scouring. When a sheep experiences a chill, it at once affects the circulation and sends the blood to the internal organs, and inflammation or scouring results. This is why sheep that have open fleeces are more subject to such diseases than those that have dense fleeces. Wool is one of the best non-conductors of heat that we have, and when it is on a sheep in the form of a dense fleece, it gives them the greatest possible protection from exposure. Furthermore, if the fleece is not dense, it is almost impossible for the fiber to be sound, — that is, free from weak spots. When a sheep has been badly chilled or has become sick in any way, so as to cause the pores of the skin to contract, a break or shrinkage occurs in the fiber at that point. The wool on a sheep grows from a small sac in the skin, and it passes away from the skin through a small opening that may be easily contracted or expanded, according to different influences. The influences are various, and for that reason it is important that the sheep be covered with a fleece that is so dense as not to be affected much by external conditions.

Length of staple. — The length of the staple is an important feature, both from a commercial point of view and from the shepherd's standpoint. Wools

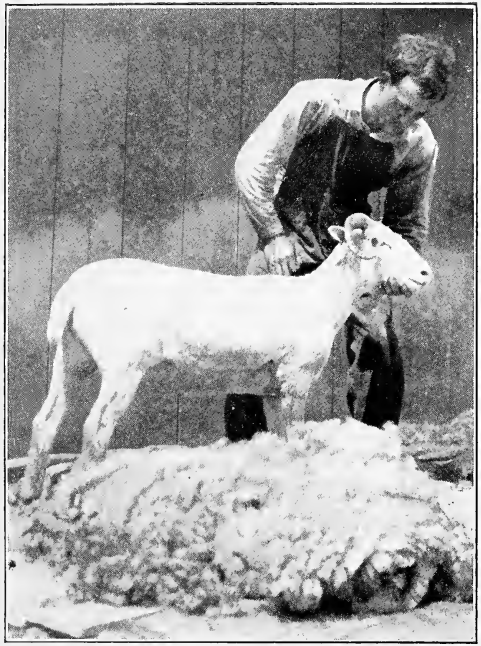


FIG. 47. — (Page 215).

FIG. 48. — A well-tied fleece. Photo. by C. W. Coffey, University of Illinois. (Page 216.)

PLATE XX. SHEARING THE SHEEP — (*Concluded*); AND TYING THE WOOL.

are generally known as short-stapled or the carding wools, which are used for woolen cloth, or long-stapled or combing wools, which are used for worsted cloth. The long-stapled wools include the Lincoln, Leicester, Cotswold, Romney Marsh, and Black-face or Highland. The short-stapled include all the Downs (Southdown, Hampshire, Suffolk, Shropshire, Oxford) and the Cheviot and Welsh. The manufacturer of woolens desires a short-stapled wool, for such a wool has better felting qualities and usually more serrations or spirals than the long wools. In manufacturing woolens into yarns, the fibers are transversely disposed to the axis or length of the thread. In yarns of this nature this feature is termed "pile." The points projecting from the center should be numerous, so that in felting the fabric unites and also when the cloth comes to be finished, it will appear on top like short fur. On the other hand, in worsted goods the object is to stretch the fibers and lay them parallel with each other, and this produces a yarn even, strong, and composed of as fine fibers as possible. In this process of manufacture, it is easy to see that the length and strength of a fiber includes its most valuable characteristics.

Examining the fleece. — In examining and valuing the fleece, the chief points to consider are the quantity, quality, and condition. The quantity is determined by the length and density. Quality of wool depends

upon fineness, luster, and brightness. Condition refers to soundness, purity, and oil or yolk. The best method of studying the nature of the fleece on the sheep is to open it first just over the shoulder. In this region the finest of the wool is found. By using the hands in a flat position instead of sticking the ends of the fingers into the wool, the fleece may be parted in a more satisfactory manner. After looking at the wool and the skin in this region, the thigh should be the next place of examination, for here grows the poorest and coarsest wool of the whole fleece. Then the covering of the wool on the belly also demands notice, for very often sheep are quite poor in this region, making the wool light and indicating a lack of constitution. By partially closing the hand upon the surface of the fleece, one may readily judge the density.

Fineness. — Ordinarily, fineness will be in proportion to density, but among dense fleeces there may be a wide variation in fineness. When the fleece is parted at the side of the shoulder, the extent to which the fibers appear to be closely packed together shows the fineness. "Crimp" is a term used to designate the waves or folds that are to be seen all along the length of the fibers. Fineness is proportionate to the closeness of these folds. In coarse-wooled sheep they are little more than waves, while in the finer breeds the crimp shows as folds at right angles to the length of the fiber and very close together.

Wool from a sheep that has been sick or is unsound from any other cause can be seen to have a less close crimp in the part of the fiber that is weak. In stretching locks of such unsound wool, it will be found that they always break at the same place.

Shrinkage of wool. — As a rule, the finer the wool, the heavier the oil. Some wools shrink as much as sixty per cent when scoured, while lighter, open fleeces may not lose over thirty per cent.

The table on the following pages from Michigan Bulletin No. 178 shows weights, shrinkages, and market grades of fleeces from sheep of various breeds.

Market grades. — The table (pp. 224–225) does not mean that the wool from a particular breed of sheep is always given the same grade upon the market. The wool trade has no regard for breed, and grades wools upon the basis of length, fineness, quality, and condition. Condition in this case includes oil, soundness, freedom from foreign matter, and way of tying and packing. The following list of prices includes the various classes and grades quoted on the Boston market: —

Ohio and Pennsylvania Fleeces

XX	28–29	¼ blood combing	29
Fine unwashed	21½	½, ⅜, ¼ clothing	23
Fine unmerchantable	23	Delaine unwashed	26
½ blood combing	30	Delaine washed	32
⅜ blood combing	30		

TABLE SHOWING WEIGHT OF FLEECE, PER CENT OF SHRINK, COMMERCIAL GRADE, AND PRICE PER POUND OF FLEECES FROM DIFFERENT BREEDS OF SHEEP

Breed	Sex	Age, years	Weight of fleece in grease	Weight of fleece after scouring	Per cent of shrink	Commercial grade	Price per pound in grease before scouring §	Price per pound after scouring §
16 American Merino . .	Ewe	3	17 lb. 12 oz.	4 lb. 14½ oz.	72.36	X clothing	$ .14	$ .50
17 American Merino . .	Ram	4	26 12½	6 10½	75.15	XX clothing	.13	.52
27 National Delaine Merino	Ewe	4	9 10	4 1	57.79	Fine delaine	.21½	.51
39 Improved Black Top Merino	Ram	1	18 11⅔	5 11	69.64	Fine delaine	.20	.66¾
30 American Rambouillet .	Ewe	2	8 1¾	3 9¾	55.42	X clothing	.20	.44½
31 American Rambouillet .	Ram	1	7 15	4 9⅓	44.19	Fine delaine	.22	.39¼
25 Cross-bred *	Ewe	1	11 1	4 5½	60.73	½ clothing	.19	.48¾
35 Southdown	Ram	1	7 5½	3 4	55.75	⅜ combing	.22	.50
36 Southdown	Ewe	1	7 1	3 8½	50.	⅜ combing	.23	.46
38 Southdown	Ewe	3	7 12	4 11½	39.11	⅜ combing	.23	.37¾
24 Shropshire	Ewe	1	10 12	5 9	48.25	¼ combing	.22	.42¼
26 Suffolk	Ram	1	6 15½	3	56.95	Low ⅜ combing	.23	.53½
29 Hampshire	Ewe	3	9 6	5 4½	43.67	⅜ combing	.23	.41

18 Oxford Down	Ewe	3	12	9	7	13½	37.56	Braid combing	.20	.32¼
23 Oxford Down	Ewe	3	15	2	8	13½	41.53	¼ combing	.19	.32¾
42 Leicester	Ram	10‡	12	8½	8	5⅔	33.33	Low ¼ blood	.19	.28¼
32 Cotswold	Ram	2	15	3	9	13	35.39	Coarse combing	.19	.29¼
33 Cotswold	Ewe	1	12	3½	7	12	36.57	Braid combing	.19	.30¼
34 Lincoln	Ram	11‡	14	8¾	10	4¾	33.77	Braid combing	.20	.30¼
40 Lincoln	Ewe	1	14	11	10	2½	30.85	Braid combing	.20	.29
43 Tunis	Ewe	11‡	8	12¾	4	5	43.75	⅜ combing	.22½	.39¼
19 Dorset Horn	Ewe	2	6	12½	4	1	40.09	⅜ combing	.22½	.37
20 Dorset Horn	Ram	1	8	2½	4	4½	47.51	¼ combing	.22	.42¼
37 Dorset Horn	Ewe	2	8	15	4	10½	47.90	⅜ combing	.22	.42½
41 Dorset Horn	Ram	13‡	9	1½	4	14½	46.04	¼ combing	.22	.40¾
28 Cheviot	Ewe	2	9	2	6	10	27.39	¼ combing	.22½	.31
21 Cross-bred †	Ewe	1	7	4	4	4	41.38	⅜ combing	.21½	.34

* Hampshire and Cotswold. † Rambouillet and American Merino. ‡ Months old.

§ Prices quoted Aug. 31, 1899.

MICHIGAN, WISCONSIN, NEW YORK FLEECES

Fine unwashed	20½
Delaine unwashed	24
½ blood unwashed	28
⅜ blood unwashed	28
¼ blood unwashed	28–29
½, ⅜, ¼ clothing	21–22

KENTUCKY, INDIANA, AND MISSOURI FLEECES

⅜ blood	28–29
¼ blood	28–29
Braid	22½
Georgia	21–22

TEXAS FLEECES

(Scoured basis)

Fine 12 months	53–54
Fine 6 to 8 months	48
Fine fall	43

CALIFORNIA FLEECE

(Scoured basis).

Northern	50–52
Middle county	48–50
Southern	46–47
Fall free	42–44
Fall defective	36–38

OREGON FLEECES

(Scoured basis)

Eastern No. 1 staple	58
Eastern No. 1 clothing	50
Valley No. 1	47–48
Valley No. 2	44–45
Valley No. 3	39–40

TERRITORY FLEECES

(Scoured basis)

Fine staple	62–63
Fine medium staple	58–60
Fine clothing	55–56
Fine medium clothing	51–53
½ blood combing	58–60
⅜ blood combing	51–52
¼ blood combing	47–49

PULLED FLEECES

(Scoured basis)

Extra	55–57
Fine A	53–55
A supers	51–53
B supers	53–54
C supers	36–38
Fine combing	53–54
Medium combing	50–52
Coarse combing	40–45
California finest	48–50
California second	47–48

The wool grown east of the Mississippi is all from farm-raised sheep. For this reason, it contains less

dirt and sand than is usually found in the wools from the range state. Texas, California, and Oregon wool clips are quoted separately, as they have certain peculiar characteristics distinguishing them from wools of other regions. The Ohio and Pennsylvania wools comprise chiefly the fleeces of highly bred and well-cared-for Merinos and are preferred for that reason. The XX grade is the finest obtainable, and is used for clothing purposes, being too short for combing. The grade "fine" is one grade coarser than XX, half blood is still coarser, and quarter blood, two grades coarser than half blood. The relation of these grades may be made clearer if instead of XX, we use the term "full blood." The term "full blood," when so used, by no means includes the wools of all pure-bred Merinos, but simply means the finest, and in the same sense, the next lowest grade would be X or three-quarters blood, then half, three-eighths, and one-quarter blood, respectively. Delaine wools are those that would grade as fine and have in addition extra length of staple to render them suitable for fancy fabrics. Similar wools in the territory classes are designated fine staple and fine medium staple.

Practically all fleeces from the various styles of Merinos, including Rambouillets, will fall into grades higher than half blood. Most Southdowns will run around three-eighths blood and usually clothing. Some Shropshire fleeces may grade three eighths and may be either clothing or combing. But few

Oxfords will grade higher than one-quarter blood, and the best Cotswolds or Lincolns would be classed as quarter bloods and the coarsest as braid or coarse combing. The coarser wool shrinks the least, and quoted on grease basis looks higher than the finer grades, but this difference disappears when values on the scoured basis are studied.

Prices and demand for various grades fluctuate very widely from one season to another, depending very largely upon the fashions in ladies' dress goods and men's suitings. When worsteds are popular, the longer wools are sought for, and when cloth goods are worn, the shorter and finer wools are on a higher price basis.

Pulled wools are secured mainly from the pelts of sheep killed at the packing-houses.

The meaning of the term "unmerchantable" is shown in a recent announcement of the Boston Wool Trade Association: "Fleeces grown east of the Mississippi River and also in the states of Minnesota, Iowa, and Missouri shall not be considered merchantable unless rolled into a firm bundle, flesh side out, free from tags or parts of other fleeces, tied with a hard glazed twine not heavier or larger than what is known in the twine trade as size $4\frac{1}{2}$–3 ply India, using not more than three single strings each way of the fleece, and all knots firmly tied. Wool put up otherwise than in this manner shall be considered unmerchantable and shall be subject to a discount of at least one cent per pound."

CHAPTER XII

EARLY LAMB-RAISING

THE phrase "early lamb-raising" refers to the production of lambs in the fall and early winter to be marketed when a few weeks old. There has been a growing demand in the larger cities for this baby lamb, or hot-house lamb as it is called, during the winter months. It belongs in the class of delicacies with hot-house lettuce, tomatoes, and cucumbers, fresh strawberries, and green peas at Christmas. It is the most profitable branch of the sheep business when rightly conducted, and is likely to remain so, because the sheep, to a greater extent than any other farm animal, adheres to its habit of yeaning in the spring, thus making it difficult to get lambs in the fall, and for the additional reason that few men will give the business that nice attention necessary to produce a strictly first-class lamb. The season for marketing the lambs begins at Thanksgiving and extends throughout the winter.

The lamb should weigh not less than 40 pounds at 8 weeks of age. That is the minimum weight at which the lamb should ever be butchered, and at that weight only at the opening of the season. Even then lambs 5 pounds heavier would command a

higher price were they on the market. Later in the season, lambs should range between 45 and 50 pounds when slaughtered. The condition of the market, the weather, and the lambs should be taken into account in deciding whether to slaughter at the lighter weight. If the lamb is very fat, the weather and the market good, or if the lamb is getting too old, better slaughter at 45 pounds of weight; otherwise the chances are in favor of profit in holding a week or two longer.

The breeding flock. — There are only three breeds of ewes that yield, to a profitable extent, in changing their breeding habit from fall to spring: the Dorset, Merino, and Tunis. A small per cent of Downs and Long Wools will breed for January lambs, but the best prices generally prevail from Christmas through January and February. By March the number going to market depresses the price.

Because Tunis and Dorset are found in such small numbers in this country, the vast majority of ewes employed in the production of winter lambs are Merinos or High Grades of some of the three breeds mentioned. The Merinos used are the better mutton type families. When mated with rams of the mutton breeds, they produce very satisfactory lambs, though requiring two or three weeks longer to grow to marketable size. Some winter-lamb growers fatten and sell the ewe flock each year; others retain them several years, even throughout their use-

fulness. Unless one has special advantages for securing ewes, I think it better to retain the flock from year to year, discarding annually only such as do not prove good mothers and those past the prime of life. After a ewe has begun to decline from advancing age, she will not produce as good lambs, her fleece will be lighter, and she herself will shrink in value very rapidly. Up to six years, or even eight with Merinos, ewes will produce better lambs than when younger.

With the right breed of ewes, the only secret under the control of man in stimulating breeding at this season of the year is that of feeding the ewe flock so as to have them improving in condition. Ewes that have never raised a lamb in the spring more readily breed for fall lambs. Cool, cloudy weather at the breeding season is favorable for mating. Even with all conditions favorable, it is not possible to secure as rapid mating in the summer as in the fall. Nor have I ever had as large a per cent of ewes breed during the summer months as in the fall. If 90 per cent of them mate, I consider it satisfactory.

Management at mating season. — Shear the ewe flock in April and feed well. There is nothing better than corn when a legume, hay, or fresh grass accompanies it. And I have found that it paid to feed corn once a day, no matter how good the pasture. Turn in the rams by May 15, and continue feed-

ing the grain once a day for two weeks, or longer, depending upon the condition of the ewe.

While desirable rams can be secured for $20 or less, it is economy to purchase an extra ram or two and turn with the flock rather than to attempt hand-breeding or to remove the ram daily and return to the flock each night. I have found it advantageous to turn two rams at a time with a flock of one hundred or more up to three hundred, leaving them in for a week or ten days and replacing with two others for a like period.

The presence of the second ram is an incentive to a little greater activity. Yet there is very little danger of rams fighting at this time in the year. A mature ram will get seventy-five to one hundred lambs. Any of the Downs, the Dorset, or Tunis are suitable. An advantage of the latter two is that their ewe lambs may be added to the breeding flock if desired. The rams should be removed by the 1st of September if it is the intention to keep the flock for winter lambs another season. A ewe that yeans after February and nurses her lamb to marketable size is not likely to breed early enough the following summer. Only occasional ewes, and they under high feeding, will mate with ram while nursing a lamb. It is not practicable to raise two crops of lambs a year.

Management of ewe and lamb. — As late in the fall as weather permits and pasture remains good,

the ewes should have a daily run in the field. They should also have grain. When the grass is of new growth, corn is a satisfactory grain ; but if the grass is mature, from early summer growth, the grain should be in part oats, bran, or some feed rich in protein. When the pastures fail or the weather becomes unfavorable for grazing, silage is the most satisfactory substitute for grass. However, as it has a much wider nutritive ratio, it must be supplemented by highly nitrogenous concentrates. The cost of a unit of protein may determine the choice of form in which this is to be purchased. As a rule, the higher the per cent of protein in the feed, the lower its cost. Oats and bran, at the usual market prices, are expensive sources of protein. Cotton seed meal has an advantage over linseed as a supplement to silage in that it counteracts the laxative effect of the silage, and when it can be bought at the same price, or less, per ton as bran, it is to be preferred, especially to feed in connection with silage.

Silage may be advantageously fed to the extent of four pounds per head daily at two feeds. The need of a protein supplement to the silage can be somewhat reduced by mixing soy beans or cowpeas with corn in the silo.

In latitudes where beets thrive well, they may be substituted for silage, also the beet pulp from the sugar factory. And it should be said that ewes can be successfully fed without any of these succulent

feeds, but, as a rule, not so cheaply. The corn plant should always be the basis of the ration. When fed, dry linseed meal is a valuable supplement. It is very difficult to make a satisfactory ration without clover, alfalfa, soy bean, or cowpea hay.

Feeding the lambs. — Soon after the lambs are two weeks old, they will begin to eat and should have a trough from which the old sheep are kept by a creep, through which the lambs can pass, but not the old sheep. The lambs should also have a separate rack for hay and be supplied with choice clover or alfalfa. They should not be required to eat more than the choice part, the balance being removed and fed to the ewes or other stock. The grain for the lambs may consist of corn, wheat, and oats with various mill feeds. Of all concentrates lambs prefer corn. For the very young ones it may be cracked, never finely ground, but after they are a month old, shelled corn is entirely satisfactory, and when alfalfa hay is fed in abundance, may be the only grain. However, a variety of concentrates is always advantageous; even sugar may be added with profit. When the hay is not the choicest, bran should be used largely, care being taken to have it fresh. A slight mixture of some of the molasses feeds is relished.

As soon as the lambs are eating well, they should be retained in the stable, though the mothers go out to graze. It is advisable to keep the lambs as quiet as possible. Lambs are easily separated from their

mothers by fastening them in their eating room by a gate closing the creep. This confinement of the lambs also makes it much easier to return the flock to the stable. A lot of frolicking lambs are often very trying on the attendant's patience when attempting to drive them into a stable. Fresh water and salt should be accessible to the flock at all times. No other condiment is necessary or profitable.

Marketing the lambs. — When a lamb gets large enough so that it passes through an eight-inch space — the width of the spaces in the creep — with difficulty, it is about ready for marketing. However, the more accurate gauge of the scales should be employed in the selection of lambs for slaughter until the shepherd has had experience enough in handling them to make close estimate of weights. One more week's growth will often make a difference of one or two dollars in the selling value.

Before any lambs are ready for slaughter, the owner should communicate with some well-recommended commission firm and ask for instructions as to the form in which they desire them dressed. Different markets have different demands in this particular, hence it is not advisable to describe here the form of dressing in detail. Some mention of method, however, may be helpful. In the evening before the lambs are to be slaughtered, separate them from the ewes and confine away from feed, but within hearing of their mothers. In the morning catch and confine

the mothers in a pen arranged for that purpose convenient to the main flock. They may be identified by returning the lambs and allowing them to find their mothers. An easier method, however, is

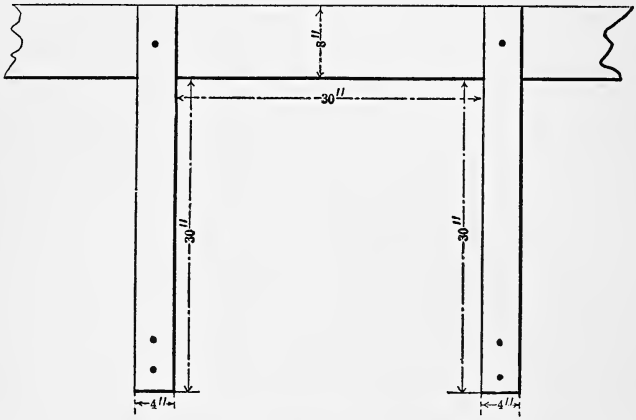


Fig. 49. — Rack for hanging up lambs for butchering.

to put a similar mark on both ewe and lamb at some earlier time when they are found together. It is important that the mothers of the slaughtered lambs be confined on short rations and their milk drawn occasionally until they are dried off. It is a good practice to let younger lambs in the flock, that may not be getting enough from their own mothers, suck these ewes once or twice a day for one or two weeks.

Equipment for butchering. — Provide a place convenient to the stable for butchering and hanging until cool. The convenient way of killing is to suspend by hind legs by means of strong twine looped

FIG. 50. — (Page 236.)

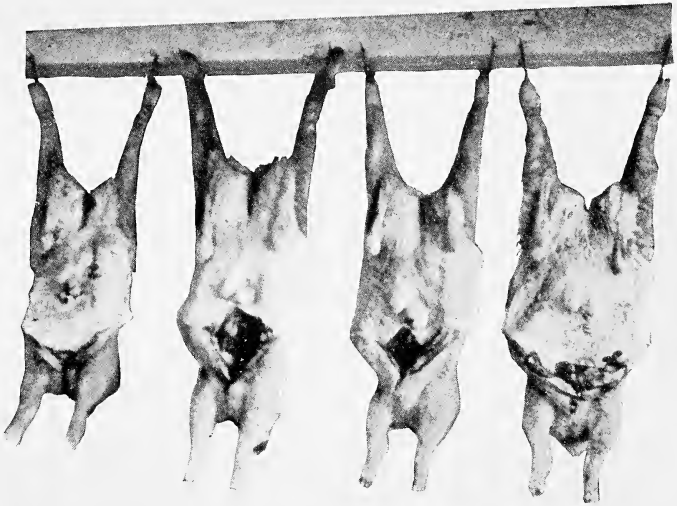


FIG. 51. — Lamb carcasses hung up to cool. (Page 237.)

PLATE XXI.

about the pasterns and hung on a peg in a support, as shown in Fig. 49. The two supports are 1×4 inch boards. Their lower end should be about 6 feet above the floor. They should be fastened at the top by a single bolt and be about 30 inches apart. Two or three holes at different distances from the lower ends enable the butcher to hang the lambs at the height most convenient for himself. A method that appeals to some as more humane is to fasten the lamb in a trough at convenient height with its head out over one end. Two small butcher knives with keen edges should be provided, also a vessel for catching the blood. Kill by severing the large artery and jugular vein in the neck (Fig. 50, Pl. XXI). Death is hastened by severing the spinal cord between the first and second vertebra. It adds to the appearance of the carcass to trim away all stained wool about the tail and flanks, also along the belly and brisket, and to wash the bare skin in the arm pits. The carcass should hang in a cool, airy place for twelve to twenty-four hours before being wrapped and shipped, long enough to be well cooled out (Fig. 51, Pl. XXI).

Shipping. — On account of the rough handling given by express companies, the only way to insure their arriving in good shape is to ship in crates, four to a crate. The crate will be returned at a nominal charge. The size of the crate must depend upon the form of dressing. When backsets are used,

it must be larger than when they are not. Make crates as light as is consistent with necessary strength. Each lamb should be wrapped in new muslin, enough to cover all the exposed tissue. Neatness in every detail in the dressing, as attention to details in feeding, is important in the winter-lamb business.

Docking and castrating. — As these lambs are slaughtered at so young an age, they are never docked nor is it necessary to castrate them. However, late in the season it is advisable to castrate lest some be left when the weather becomes too warm to ship, and ram lambs sent to the market alive have to go at a discount.

These lambs may be sent to market just as late in the spring as weather conditions will permit. In the spring it is an advantage to be near one's market. During cold weather, they may be shipped five hundred miles or even farther.

Markets. — In years past, New York and Boston have been the principal markets, but a market for this product may be developed in almost every city with its first-class hotels and restaurants.

Buildings. — The barn for this branch of sheep husbandry must be capable of being closed tightly, yet must be well lighted and ventilated. Doors should be made in two sections, so that the upper part can be kept open in all pleasant weather. The windows should be so arranged as to open easily. A good plan for this is to have them hinged at the

bottom and the frame arranged so as to let the sash lean in at the top, thus admitting air, but excluding snow or rain. In colder climates, the flock may well be confined to the stable all the time after winter opens. Feed racks must be so designed as to keep lambs out of them, and when ensilage is fed, so as to be closed against the sheep until the feed is distributed. Figure H represents a rack that has been found very satisfactory on the writer's farm, where ensilage is fed. It is equally satisfactory when only dry grain and hay are fed. With the sheep completely shut away from their feed as it is being distributed, they get in the way very little. And they can be avoided entirely by the feeder walking in the rack on the raised center connecting the troughs. I have never seen any other style of rack so entirely satisfactory for feeding large flocks of ewes with lambs. At least one foot of feeding space should be provided for each ewe of the smaller breeds and more for the larger ones. Be sure to have enough so that every ewe can get her full share of feed at each feeding.

Floor space. — It is, of course, desirable to reduce the investment in buildings to the minimum per ewe. After ewes have yeaned, no provision for exercise for them need be made, and much activity on the part of the lambs is not desirable, as it gives a dark color to the muscles that is objectionable in the dressed carcass. Ten square feet of floor space per ewe, outside of that occupied by racks and the feeding room for lambs, is sufficient.

CHAPTER XIII

FATTENING SHEEP

In farm flocks, practically all the sheep fitted for market are lambs. A few cull ewes need to be fattened in most seasons, but it is the finishing of the lambs that has most to do with returns and requires special study. There are three plans of disposing of lambs. The first is to have the lambs come early and then to feed them liberally in pens from which the ewes are excluded. The milk flow of the ewes is also kept up by good feeding, and lambs are marketable at fifty pounds or upwards. Selling at this age avoids trouble from summer parasites and the extra value on the early market makes the returns as large as from heavier lambs marketed later at a lower price.

Age at which to feed grain. — The second plan is to market the lambs at weaning time or shortly after. The third is to wean the lambs and run them on pasture until winter, when they are fattened and sold when ten or eleven months old. In the first plan, the lambs must be fed grain while on the ewes; with the other plans, feeding at that stage is optional. An extensive series of experiments was conducted at the Wisconsin Experiment Station to determine

whether or not it pays to feed grain continuously from the time lambs are born until they are put on the market, or whether it pays to only feed them grain after they have been weaned, or it may be still later when they are put in the sheds for winter fattening. The two practices that are most strongly represented in these ways are the practice of the farmer, on the one hand, who does not feed his lambs any grain during the summer season, and the practice of the feeder who forces animals continuously from their birth. It is a common belief that when lambs are not fed grain within three or four months previous to putting them on the market, they will make a more rapid gain and a more profitable one, during the time of feeding, and then the cost of gain previous to that has been very slight. The question resolves itself into the proposition that it pays better to grow the lamb on pasture and such rough forage as is obtainable and feed him for market on grains. The other practice opposed to this recognizes the fact that the younger the animal, the greater the gain on a common given amount of food, and the aim of the feeder who follows this practice is to force the lamb to eat as much as possible from the time it is dropped until it is put on the market. To analyze the differences in the practices and to indicate which are the most profitable under average conditions, it will be best to divide the life of a lamb that is being fed for market into three periods. The

first period is that before weaning; the second that after weaning; and the third the fattening period.

The object of the Wisconsin experiments was to determine whether it pays to feed grain only in the third period, or in both the second and third periods, or whether grain should be fed through all periods, that is, from the birth of the lamb until marketed. Grade Shropshire ewes were used and divided into three lots.[1] All the ewes received exactly the same treatment throughout the season and were practically uniform in milking qualities. One lot of lambs had access to a small compartment where grain was fed to them. The lambs in the two other lots were not given any grain, and the ewes had exactly the same management as the others. When the ewes were in the shed in the early spring, it was an easy matter to feed the lambs in this way. When they were turned out, both the ewes and lambs ran together on the same pasture, night and morning. The lambs getting grain were separated from the others and allowed to have access to the apartment in which their grain was fed them. This was the method followed until weaning time; then all were weaned at the same time and put together on the same run of pasture. At night the lambs receiving grain were separated from the others and fed their ration at this time. From weaning until fattening,

[1] These experiments were reported in the thirteenth and twentieth annal reports of the Wisconsin Experiment Station.

there were two lots getting grain, with the third lot having nothing but pasturage, and those that were getting grain were fed such a ration as was thought would contribute to their growth. As soon as the snow prevented further feeding on pasture, the lambs were put in pens and fed exactly the same kind of ration, although the amount eaten by each was separately determined. Through this period, all the lambs were fed so as to make the quickest and the most economical gains. They were managed exactly alike and fed similar foods. In a general way the lambs were divided so as to be as near the same age as possible. At the time the experiment started in the spring, the lambs would be about one month old in all trials. The first period before weaning extended over twelve or thirteen weeks, and the lambs were usually weaned in July or the fore part of August, making the first period twelve or fourteen weeks. During the second period, that usually extended from the fore part of August until the first of December, the lambs were fed for about twelve or fourteen weeks. The third period ended when the lambs were marketed, usually in February. The test thus planned was carried out in five seasons, 1891 to 1895, inclusive. The tables show that these lambs were heavier than the markets in subsequent years cared for in lambs, but the economy of utilizing the capacity of a young animal to use feed economically is clearly demonstrated.

It was aimed to grow the lambs during the first two periods rather than to fatten them, and in each case the rations were fed with this object in view. The result of this work shows that the gains made by the lambs in lot I (those fed grain before weaning) was much greater than by those not receiving grain, and that it took less grain for one pound of gain than during any of the other periods. The gains made by the lambs fed grain after weaning were not economical, as the figures show. The result of feeding grain at this period depends upon the amounts fed. If more than one-half pound per day were fed, the lambs would rely on the grain and not eat much pasture, which resulted in their not making economical gains. In every trial where the grain was limited to one and one-half pounds per day, the cost of the gain was satisfactory. The results also show that feeding lambs before and after weaning did not lessen the gain made during the later fattening period.

The grain-fed lambs matured considerably better than those not receiving grain previous to the fattening period. In three trials the lambs that had grain from birth weighed as much seven weeks before the end of the experiment as did the others when the experiment was completed. By taking the average weight of the lambs in lot III at the end of the trial and comparing it with the cost of feeding the lambs in lot I until they were of the same weight,

it was found that those fed grain from birth made a cheaper gain in each case.

To determine which of these methods of feeding lambs was the most profitable, it was necessary to make a comparison of the amount that would be received for them on the market minus the cost of the feed they consumed. The table which follows gives the data for each of the three periods of the five trials.

This comparison was made by finding what each lot would bring on the market at the end of each period from the average weight per head based on the average price they would bring on the market and deducting the cost of the grain consumed. The prices used for determining their value on the market was obtained by taking an average of the price placed on each lot at the end of the period by a local butcher. The prices were based on Chicago market prices furnished by a live stock commission firm, the results of memoranda of representative sales of lambs weighing about the same as the lambs in these trials at the end of each period.

A glance at the table on the following page will show that there was considerable difference in the price per hundred at which the different lots were valued at the end of the same period, as well as between the values of the same lot during the other periods. In every case, the lambs fed grain from birth would bring a higher price, if sold at the end

THE AVERAGE COMPARATIVE PROFIT MADE BY EACH LOT FOR EACH PERIOD DURING THE FIVE TRIALS

FIRST PERIOD (BEFORE WEANING)

NUMBER OF LOT	NUMBER OF LAMBS	CORN MEAL	BRAN	OIL MEAL	OATS	WHEAT	HAY	CORN FODDER	ROOTS	TOTAL COST OF FEED	AVERAGE COST OF GRAIN PER HEAD	AVERAGE WEIGHT OF LAMBS AT WEANING	VALUE PER 100 POUNDS	COMPARATIVE VALUE PER HEAD	COMPARATIVE PROFITS
		lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.			lb.			
I . .	30	264.64	610	353.8	17.3	108	—	—	—	$10.04	$.33	68.6	$5.69	$3.90	$3.57
II . .	9	—	—	—	—	—	—	—	—	—	—	64.2	4.74	3.04	3.04
III . .	30	—	—	—	—	—	—	—	—	—	—	61.1	4.74	2.89	2.89

SECOND PERIOD (AFTER WEANING)

I . .	23	610.0	—	305.0	1361.25	—	—	—	—	$25.76	$1.12	98.4	$4.84	$4.76	$3.64
II . .	9	—	—	—	478.5	—	—	—	—	3.78	.42	87.3	4.34	3.78	3.36
III . .	23	—	—	—	—	—	—	—	—	—	—	81.9	3.84	3.14	3.14

THIRD PERIOD (WINTER FATTENING PERIOD)

I . .	22	1619.6	—	556.8	1969.4	—	2115.2	989.2	876	$13.94	$3.12*	141.2	$5.34	$7.54	$4.42
II . .	9	841.6	—	149.8	749.6	—	940.5	—	—	13.37	1.91†	117.1	4.89	5.72	3.81
III . .	22	1474.1	—	531.4	1826.3	—	2136.4	891.7	811	41.36	1.88	123.1	4.89	6.01	4.13

* Average cost of grain per head during the three periods.

† Average cost of grain per head during the two periods.

of the weaning period, as well as at the beginning of the fattening period and at the end of the period, than those not receiving grain.

The preceding answers the question in the affirmative, whether it pays to feed lambs grain if they are sold at weaning time or at about four months old, since the lambs fed grain from birth show a greater comparative profit by 68 cents per head.

The question, Does it pay to feed grain to lambs before and after weaning if sold in November? is also answered in the affirmative. Those receiving grain from weaning returned a greater profit than either of the other lots.

Corn for fattening sheep. — This assuredly is the most fattening farm grain that may be fed to sheep. In relying on it alone, however, there is much difficulty in maintaining the appetites of the sheep and in preventing disorders and deaths. At common prices it is the cheapest grain. In feeding timothy or prairie hay, straw, or corn fodder, a grain ration of corn alone would be unsatisfactory aside from the disadvantage of the lack of variety. With clover, hay, or alfalfa, corn has combined to give excellent results in numerous experiments and in commercial feeding.

Oats. — This grain is especially desirable for getting sheep or lambs on feed. It is safe to begin with. Fed alone continuously, oats do not produce as great gains as corn does, and as the fattening period ad-

vances, the proportion of oats should be decreased. Much, however, depends upon the form of roughage in use and comparative prices of these grains.

Peas. — Peas are excellent feed for sheep. With breeders they are especially prized for producing firm flesh. They are more suitable for feeding with carbonaceous roughages than is corn and, when their price allows, will be found a very satisfactory feed.

Bran. — When bran was cheaper than it has been in most years since 1900, it was quite largely used in sheep feeding. Like oats, it is very useful in avoiding disorders when commencing grain feeding, and its cooling and laxative tendencies make it very useful, especially when the alfalfa or succulent feeds are not available.

The farm feeds mentioned were tested at the Wisconsin Station with lambs before weaning in four experiments. The average of the result of the trials showed that a slightly smaller weight of bran was required for each pound of gain than of ground corn. A somewhat greater weight of oats was required than of corn, and cracked peas were less effective than oats.

In similar tests of these feeds with weaned lambs, corn and peas were equally useful, while oats and bran each required a half greater weight for a pound of gain than was needed of corn or peas. In a test of mixtures of these grains, there was required for a pound of gain 5.3 pounds in case of corn, 6.3 pounds

of corn and oats, 5.1 pounds of corn and peas, and 5.6 pounds of corn, oats, and peas.

Wheat. — Wheat has been used extensively. Montana experiments show returns at the rate of 100 pounds grain from 300 pounds of sound wheat and 800 pounds clover hay when the daily ration was .8 pound wheat and 2 pounds hay. In feeding 1.5 pounds wheat and 1.3 pounds brome and prairie hay, the South Dakota Station secured 100 pounds gain from 534 pounds wheat and 470 pounds hay. So far as the results of various experiments are comparable, they show that from ten to fifteen per cent more wheat than corn is necessary for a 100 pounds increase in weight.

Barley. — Barley is only slightly inferior to corn for fattening purposes, though, as in feeding of corn, the results are much better when a nitrogenous hay or roughage is used.

Soy beans. — On account of their high price, soy beans have not been widely used in fattening sheep. Such results as have been obtained indicate for them a very high value, and when leguminous hay cannot be used, beans should be especially valuable.

Roughages for fattening sheep. — The following tables of results from experiments at the Ohio Station[1] gives a very fair idea of the relative of four of the commoner roughages: —

[1] Ohio Experiment Station Bulletin No. 245.

EXPERIMENT LASTED NINETY-THREE DAYS, JANUARY 3 TO APRIL 5, 1911, INCLUSIVE

LOT NO.	NUMBER OF LAMBS IN LOT	RATION	INITIAL WEIGHT	FINAL WEIGHT	TOTAL GAIN 93 DAYS	AVERAGE DAILY GAIN	FEED CONSUMED PER 100 LB. GAIN			
							Corn	Oil Meal	Roughage	Total
			lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
I	14	Corn and clover hay	899	1313	414	.318	405		384.5	789.5
II	14	Corn and alfalfa hay	880	1327	447	.343	377.6		374.6	752.2
III	13	Corn and oat straw	824	1043.5	219.5	.182	713.2		584.4	1297.6
IV	13*	Corn and corn stover	844	1021.5	266	.225	571.4		613.5	1184.9
V	14	Corn, oil meal, and clover hay .	899	1281	382	.293	369.9	74	413.4	857.3
VI	14	Corn, oil meal, and alfalfa hay .	895	1335	440	.338	321.1	64.2	382.8	768.1
VII	14	Corn, oil meal, and oat straw .	885	1192	307	.236	460.2	92	469.4	1021.6
VIII	14	Corn, oil meal, and corn stover .	873	1210	337	.259	419.3	83.9	528.3	1031.5

Experiment lasted Eighty-three Days, November 18, 1911, to February 8, 1912, Inclusive

I	15	Corn and clover hay	919	1332	413	.332	373 5		381.6	755.1
II	15	Corn and alfalfa hay	924	1387	463	.372	329.2		361.8	691
III	15†	Corn and oat straw	889	1075	260	.219	514.2		485.3	999.5
IV	15	Corn and corn stover	866	1187	321	.258	452.2		462.8	915
V	15	Corn, oil meal, and clover hay .	939	1361	422	.339	304.6	60.9	408.6	774.1
VI	15‡	Corn, oil meal, and alfalfa hay .	921	1323	461	.387	265.6	53.1	382.4	701.1
VII	15	Corn, oil meal, and oat straw .	927	1234	307	.247	418.4	83.7	423.7	925.8
VIII	15	Corn, oil, meal, and corn stover .	899	1283	384	.308	335	67	441.4	843.4

* One lamb taken out March 9, weight 88.5 pounds.

† One lamb died December 10, weight 74 pounds.

‡ One lamb taken out of lot December 16, weight 59 pounds.

Note. — Lots V, VI, VII, and VIII in each experiment were fed a mixture of 5 parts, by weight, shelled corn to 1 part oil meal.

In the first experiment, the lot fed alfalfa hay required 377 pounds corn for 100 pounds gain, while with clover hay 405 pounds were required. Though the weight of corn stover fed lot IV was much greater than that of the hay fed to the first two lots, 571 pounds corn were used in making 100 pounds gain. A slight advantage was gained by adding oil meal to the clover hay ration of lot I in the second trial, though the extra cost would offset this extra return. The alfalfa, corn, and oil-meal ration of lot VI was but little more effective than the alfalfa and corn fed lot II. The addition of oil-meal to the corn-stover ration effected a reduction of over twenty per cent in the feed required for a pound of gain. A more striking economy was effected when oil meal was added to the oat-straw ration. The coarser roughages are seldom used with economy in fattening sheep. They are useful, but if alfalfa or clover is not used, the grain ration must be supplemented to supply the lack, and keeping sheep eating regularly is especially difficult when concentrates are the main reliance. The results of the second test give the rations the same relative values, though the differences are less striking.

Sorghum hay. — Fattening experiments with alfalfa and sorghum hay show about the same difference as between corn stover and alfalfa and a similar gain from use of linseed meal with the ration of corn and sorghum hay.

Silage. — Although silage was for some time con-

sidered an unsafe feed for sheep, it has an important place in economical sheep husbandry. Special precautions are necessary to avoid feeding of spoiled silage, as the effects of deterioration are much more pronounced with sheep than with cattle. Silage from corn rather well matured is desirable for sheep. Owing to the sheep's limited capacity, there is danger in not making proper allowance for the grain in the silage, especially when the main grain ration is a liberal one, and as a result difficulties arise not properly attributable to the silage. In most of the sheep-feeding experiments in which silage was used, it was compared with roots. At the Iowa Station a ration of 2 pounds grain, 1.6 pounds alfalfa, and 1.4 pounds silage was found to produce the same gain and at a much lower cost than the same grain and alfalfa with 4.3 pounds mangels in place of 1.4 pounds silage. Silage was fed at the Michigan Station in tests lasting 119 days, and 3.4 pounds fed daily produced larger and cheaper gains than 5.6 pounds rutabagas.

Fattening lambs on rape. — There are exceptional possibilities in well-grown rape for fattening lambs, if it is fed with proper judgment and care. It may be fed to best advantage in the early fall, and hence is of valuable assistance in fattening lambs for the fall or early winter market. It supplies a vast amount of food that the lambs are very fond of, and as it withstands drought and early frost better than most succulent fodders, it is a crop that may be

relied upon with at least common certainty. The first trials reported with rape for fattening lambs were made in England about 1845. Ten wethers fed on rape alone from August 10 to September 21 made an average increase in the six weeks of 20 pounds, or 2 pounds per head weekly.

The most extensive trials in feeding lambs on rape have been carried on at the Ontario Experimental Farm. In 1890, 54 acres of rape pastured 17 head of steers and 537 sheep, and 1 acre of the rape sustained 12 lambs for two months. It is estimated that the food provided by an acre of rape was worth $16.80. In another trial, rape alone was fed to 60 lambs, and they were kept on 2.18 acres for twenty-five days, during which time they increased in weight 390 pounds, or an average weekly increase per head of 1.82 pounds. Again, in an experiment on one-sixth of an acre, 6 lambs were kept for forty-two days, and from this it is concluded that 1 acre would have pastured 36 lambs two months and have made 762 pounds of mutton.

At the Michigan Station, 15 acres of rape pastured 128 lambs for seven and one-half weeks, with a total gain of 2890 pounds. At this rate it is estimated that 1 acre would pasture 9 lambs seven weeks, and they would produce 202.5 pounds of increase. It is stated that the field would unquestionably have pastured 10 lambs for the period of ten weeks.

Rape and pasture. — At the Ontario Station an

experiment was tried in feeding rape alone against rape and pasturage. Thirty lambs comprised the two lots, the one being put on an acre of rape and the other given a similar amount with pasture. In fifty-eight days both lots had eaten their respective acres, but the 15 on rape alone gained an average of 22.93 pounds per head, and those receiving rape and pasture 28 pounds per head, thus showing the advantage of having pasturage for the sheep to graze when being fed on rape.

Precautions necessary in feeding rape. — When sheep are being herded on rape, there is danger of bloating or diarrhea from excessive eating. Pasturing the sheep for a few hours previous to turning them on the rape, or allowing them to have the range of a small piece of pasture at all times, will assist in preventing these troubles. The use of the trocar and cannula is the most efficient method of relieving bloat in urgent cases, while in mild attacks the giving of ammonia, a teaspoonful in three times as much water, will usually bring relief.

Shearing lambs before fattening them. — When lambs are being fattened early in the fall or in preparing them for winter fattening, it is a profitable practice to shear them before the fattening begins. At the Ontario Experiment Station, 10 lambs sheared in January made practically the same gain in weight as 10 others not shorn and similarly fed. At the Wisconsin Station, no advantage has been

found from shearing in December. Those shorn yielded a total of 2 pounds less washed wool than the others and made a total gain of 2.7 pounds less than the wethers that were not shorn.

Shearing in October. — It was found decidedly beneficial to shear lambs in this month before fattening them. Five wethers were shorn October 14 and fed for fifteen weeks, against another lot of 5 left unshorn. The shorn lot gained 225.5 pounds and the unshorn 210.5 pounds, or an average weekly gain per head of 3 pounds for the shorn and 2.8 pounds for the unshorn. The cost of 100 pounds of gain was $6.11 with the shorn lot and $6.67 with the unshorn. In another trial with 16 wethers, 8 were shorn October 6, and the same number left unshorn. In ten weeks feeding, the shorn lot gained 194.4 pounds, or 3.4 pounds per head weekly, while the unshorn lot gained 169 pounds, or 3 pounds per head weekly. In both of these trials, it was observed that the removal of the fleece hastened the early maturity or fattening of the wethers up to the time the fleece had again grown over 1 inch in length, or until about eight weeks had passed.

System of feeding. — There is unlimited variation in general practice in regard to this point. It has been the custom to feed the grain first, then the succulent food, and last the dry fodder. In feeding fattening sheep, the aim should be to induce the wethers to eat as much as possible. At this time

they should receive all the grain they will eat up eagerly. To secure the best results, it is a good plan, when it is possible to do so, to feed the grain in two or even three feeds. This may be done easily when less than one hundred are fed together, but with more than that it is not a commendable plan. By feeding only one-third of the full feed intended, it is easy to gauge the appetites of the wethers, which is a very important matter. The smallest degree of overfeeding is certain to react on the gain of the sheep, for in some instances it will probably cause scouring, in others constipation, and it may even result in the loss of some of the lambs.

Essentials in management. — There are two essentials that contribute to cheap and rapid gains, and these are quietness and confinement. The least excitement brought on by the appearance of dogs, haste, or abuse on the part of the attendant is certain to be shown by the scales. For some time the Wisconsin Station used yards in connection with the fattening pens, but for the two years they were removed, better results seem to follow.

Quantity to feed. — Careful attention must be given to the amount of grain that is fed. This part of the ration costs most, gives the quickest returns, and is the most likely to produce some disorder in the digestion of the sheep. For the first two weeks, it is much better to give them only one-half what they need than to feed them too much; especially

is this true if over fifty sheep are being fed together. Starting the sheep safely and well on a ration brings the feeder's skill into play, particularly if the sheep have been unaccustomed to grain. There are some foods that are safer than others to feed at the beginning, and among these oats or bran have a general preference. Wheat is comparatively safe, while corn is probably the most dangerous to feed alone. One pound per head daily of either bran or oats is liberal feeding for sheep that are accustomed to grain, and a slightly smaller quantity will be sufficient for those that have not been accustomed to it. The quantity of grain may be gradually increased as the capacity of the sheep to consume it becomes greater. The careful and successful feeder trains his sheep to eat with as much carefulness as the trainer teaches a colt to trot. It is safe to assume that wethers at this age may be fed all the grain that they will eat, as it is usual for them to profitably utilize it in making gain, unless they are unhealthy or the management is defective. It is a hard matter to estimate the amount of grain to feed, owing to the variation in the consuming capacity of sheep. In starting, from .5 pound to 1 pound may be fed. A month later the wether will probably be taking 1.5 to 2 pounds, and during the last month from 2 to 3 pounds per head has been the capacity of most of the sheep.

Cost and value of the increase. — In comparing

foods for fattening sheep, it has been the custom to compare them on the basis of the cost of 100 pounds of gain, overlooking the increased value per pound that the sheep realizes in the market because of the improvement that has been made during the feeding period. It is but a moderate advance to consider that sheep that are bought as feeders at 5 cents per pound will bring 6 cents per pound when sold after fattening. In estimating the profits from any ration, the ration should be credited with this increased value per pound of the sheep.

Buying sheep to fatten. — The profits of buying and fattening sheep depend upon two things: the cost of the gains and the difference between the buying and selling price, or the margin. If feed is high and gains therefore expensive, a wide margin will be required. If there is a wide difference between buying and selling prices, there may be a profit even though the amount of weight put on when sold should not repay the cost of the feeding. The increased value of the purchased weight in such a case amounts to more than the gains lacked of paying for the feed eaten.

The success of speculative feeding depends upon the ability brought to bear in buying the feeders. The buyer must select sheep that will gain economically and sell well when finished. He must also secure them at such a price as to have a fair chance of receiving a satisfactory margin over the purchase price.

A smaller margin is needed to insure a profit when sheep sell at high prices than when they are low. This is true even though the purchase price is also high. If the finished sheep are also sold at high prices, then there has been a greater return received for the weight put on in feeding and a security against loss in the feeding itself. If, at the same time, the cost of feed was less than the selling value of the increased weight, then the outlay and feed expense would be recovered even if the selling price was lower than the purchased price.

This is shown in the italicized figures in the following table from Ohio Bulletin No. 179. The lower left-hand figure, 6.638, is the selling price that would repay the entire outlay in a case in which sheep were bought at $7.50 per hundredweight and fed upon hay at $6 per ton and corn at 45 cents per bushel. The table assumes a consumption of 5 pounds roughage, 4 pounds grain for each pound of increase. Lambs bought at the same price and fed upon feed valued at the highest figures shown would return their cost selling at 5 cents per hundred below the original cost. In the case of the lower value and expensive feeds, a margin of $1.35 is necessary to prevent loss.

EFFECT OF VARYING VALUES OF FEEDS AND FEEDER LAMBS ON COST OF FAT LAMBS

ASSUMED VALUES OF FEEDS	Hay per Ton						
	$6	$9	$12	$9	$9	$6	$12
	Corn per Bushel						
	.45	.45	.45	.30	.60	.30	.60
ASSUMED HOME PRICE PER CWT. PAID FOR FEEDER LAMBS	Price at which Fat Lambs must sell per Hundredweight at Home to pay for Feeder Lambs and Feed used on Basis of Assumed Price.						
$3.00	3.546	3.783	4.020	3.446	4.121	3.209	4.357
3.50	3.890	4.127	4.363	3.789	4.464	3.553	4.701
4.00	4.234	4.470	4.707	4.133	4.808	*3.896*	5.044
4.50	4.577	4.814	5.050	*4.476*	5.151	*4.240*	5.388
5.00	*4.921*	5.157	5.394	*4.820*	5.495	*4.583*	5.731
5.50	*5.264*	5.501	5.737	*5.163*	5.838	*4.927*	6.075
6.00	*5.608*	*5.844*	6.081	*5.507*	6.182	*5.270*	6.418
6.50	*5.951*	*6.188*	*6.424*	5.850	6.525	*5.614*	6.762
7.00	*6.295*	*6.531*	*6.768*	*6.194*	*6.869*	*5.957*	7.105
7.50	*6.638*	*6.875*	*7.111*	*6.537*	*7.212*	*6.301*	*7.449*

CHAPTER XIV

PREPARATION OF SHEEP FOR SHOW

It cannot be considered otherwise than proper to have animals that are to be exhibited appear at their best by legitimate means, but in such methods as trimming the sheep into shape, felting the wool with hot irons, staining it with dyes, and kindred practices that enter into the preparation of sheep for show, there is unlimited scope for deception. In trimming, the shears are made to do the work that should be done by breeding, and through coloring and oiling the novice is likely to believe that the sheep has qualities which it does not naturally possess.

In selecting sheep for show and getting them into the condition, bloom, and general appearance to show their good qualities, there is much that calls for the shepherd's skill. The discussion which follows is from the pen of the late William Watson, whose success in the show ring with stock from Turlington Farm was well known some years ago.

Importance of breeding. — It is important to select the best-bred sheep for exhibition purposes. As a rule, it is aimless labor to attempt to prepare underbred animals. A complete equipment for

this work is only secured by progressive breeding and the purchase of superior animals. To insure success, these factors must be further strengthened by skill, taste, and judgment.

Time of birth. — In beginning this work, it is advisable to have a number of early lambs from which to make a selection; though, on the other hand, it is quite possible to have them dropped too early in the season for the best results. When the lambs have been weaned too early, they become coarse and lose the fineness of fleece and the peculiar style that is characteristic of lambs by the time they are to be shown. For these reasons, judgment must be used in respect to the age of the lamb selected for training. It is not advisable to select early lambs merely for their advantage in size, for this is usually considered by judges to be secondary to quality.

Large number needed. — Show sheep must be matched; therefore, it is necessary to prepare a larger number than is actually needed from which to make the final choice. Twice as many should be included in the first draft as are actually required, and they should be treated alike. It is possible that some may die; some become foundered or perhaps grow coarse.

Matching sheep. — In the selection of show sheep, it should be borne in mind that it is necessary to observe much care in matching them. The influence of this is illustrated by the following experience:

"In 1847 I showed ten Southdown ewes from my father's Keillor flock at the Highland Society's show at Aberdeen. I was anxious to win both first and second prizes and to displace a worthy opponent, the late Duke of Richmond. In striving to do this, the ten ewes were divided into two pens of equal merit instead of making one superior pen and another inferior to it. The outcome was the loss of the first prize and the gain of the second. James Crisp, the celebrated breeder of Shorthorns, was one of the judges. Meeting him afterwards, I asked him the reason for the award. His answer was, 'Young man, you divided the goodness; otherwise, you could have easily won the first prize.'" This is one of the most common sheep-yard mistakes inimical to the exhibitor's interests.

Shed or field feeding. — In preparing show sheep, there is a choice between house and open-air feeding. I have found that sheep kept in the open air with an abundance of sweet herbage and other feed seem more contented than those confined, and the mortality is decidedly less; but my preference is for house feeding, because the wool may be brought to a higher state of perfection and that is always a very material point with the judges. Sheep intended for exhibition should be housed early. There is a difference of opinion among exhibitors whether late or early shearing is best, but this is dependent on the breed of sheep. Those with long wool should

be shorn early, while the Downs do better if shorn later.

Attention to the feet. — The housed sheep should have a regular supply of litter to keep their wool unstained and their feet sound. To further assist in doing this, some shepherds allow their show sheep to run on pasture for an hour or so in the morning and also in the evening, but as a rule, it is best not to disturb the sheep in this way. The feet of the sheep should be trimmed periodically, and care should be taken to avoid paring too deeply. The tread should always be on the sole of the foot, which will remain sound if the outer edges are properly pared. Neglect paring and the superabundant growth doubles under the foot and incloses filth. This predisposes the sheep to foot rot, which always results in a loss of flesh. It is an important matter for stock in the show arena to stand level on their feet, and this depends greatly on the care taken in the use of the paring knife.

Variety of foods required. — Sheep should be fed the best of everything that is in season, whether it is rape, clover, tares, thousand-headed kale, or cabbage; all of these may be grown to perfection in the greater portion of this country and at least some of them in all regions. In addition, a continued variety of food should be given, including such as linseed cake, beans, peas, bran, oats, barley, wheat and lentils, or locust beans. No definite rule can be given for

mixing these, but none of them should be fed in any quantity alone. By giving a wide variety of foods, it is not possible to secure the most economical gain, though there is no doubt but that the most rapid gains are made by these means.

Sustaining the appetite. — The chief secret of successfully feeding show animals is to make them relish their food. If their appetites fail, at once make a change. The substitution of one variety of meal for another will generally give the desired stimulus to a sickly appetite. Oftentimes it may be advisable to also reduce the ration until they will eat it again with a relish.

Feeding during summer. — It is difficult to feed successfully during the hot season; yet it can be done and the sheep kept on full rations. The sheep that I prepared for show during the summer of 1891 were housed during the hot period. They were first fed at sunrise, and at that time they would eat greedily; at nine in the morning they were again fed, and their appetites were closely watched and encouraged at times by an extra handful. At twelve o'clock they were allowed a few roots, cabbages, or freshly cut clover. These were cooling and they ate them heartily. As the heat decreased by four o'clock, they were then given a small grain ration, followed by roots, cabbage, or clover. After resting until seven o'clock, they were fed as much grain and roots as they would relish. The doors of

the pen were opened so that each lot went by turns into the exercising paddocks. At this time, their pens were littered with fresh straw and sedulous attention given to the cleanliness of the feed and water troughs. The last meal was given at nine o'clock; the temperature being cool, they ate with keen appetite. They had grain and a few cabbages. Some sweet hay was left in their racks and fresh water put in their troughs, as they drank freely during the night. With this treatment, and by feeding small quantities frequently, it will be found that the sheep will take their full ration at this season. Some of our most successful exhibitors have obtained the best results from feeding their sheep food in a sloppy condition during the heat of summer. If this is done, careful attention must be given to the feed boxes that they may not become sour.

Overfeeding possible. — In fitting animals for exhibition, it is necessary to be cautious in regard to feeding them heavily. Begin early to train them to eat by increasing the amount of feed gradually. Heavy feeding on a rich ration without preparation for it is apt to bring on some digestive troubles that will materially check the progress of the sheep. Owing to this fact, some feeders (A. Mansell, "Formation Pure Bred Flocks," page 15) will not use peas or beans, it being claimed that these produce derangements of the system, which become evident in weak legs and a shrunken appearance of the body. This

is stated to be more likely to occur in instance of lambs. It has been asserted that the feeding of such food as beans also produces a feverish condition of the system, and that many of the casualties attending the showing of fat sheep have been due to this. The barrenness of show ewes has been attributed to the same cause, and for this reason, some feeders prefer to rely on such foods as tares, oil cake, barley, and oats. I can say that during my experience of over fifty years in preparing show sheep, I have fed most liberally of beans, peas, and locust beans, and I have only observed one instance of any bad effects resulting from feeding them. I also know that John Webb followed a similar practice and that Mr. Hersel, the shepherd of the Duke of Richmond and the best feeder of my acquaintance, fed his prize winners on oats, oil cake, and beans. Only on one occasion during my long experience has barrenness resulted from feeding ewes for show, and that was when four out of seven yearlings that I had fed on locust beans became unfertile. To be safe in this matter, it may be best to assume that the use of beans should be limited in extent, especially as it is possible to prepare breeding sheep for show without the use of such foods.

How Smithfield winners were fed. — Some years ago a neighbor of mine in Scotland, Mr. David Buttar of Corston, the celebrated Shropshire breeder, exhibited a pen of fat wethers at Smithfield and won

the first prize with them. The details of the management of these sheep are as follows: They were the choice of three hundred fat lambs sired by Shropshire rams and out of half-bred ewes that were kept at great expense to make both ewes and lambs ready for selling early in the season. After being taken from the ewes, the lambs were put on good grass, with access to the shed, where oil cake, cotton cake, corn, and oats were supplied them. These feeding stuffs were mixed indiscriminately, the chief aim being to make the sheep eat as much as possible. No condiments, sugar, molasses, or milk were given. During the winter the sheep received a good abundance of good Swedish turnips, cut in troughs and fed with the same artificial food before mentioned. They were allowed to take exercise at will. Early in the spring, some grass was given them in troughs in the shed. They were clipped moderately close in April, then washed and trimmed. At the end of July they were shown at the Highland Society's show and afterwards at Smithfield, and at both these they were the champions of their classes.

How Chicago winners were fed. — In my experience, the continued feeding of condiments has been unsatisfactory. I have obtained the best results in feeding show sheep by giving them nutritious food, such as linseed cake, bruised oats, cotton cake, barley, and corn. These foods varied and used along with roots, hay, grass, or cabbage have been the

most satisfactory. The use of such substances as treacle is to be condemned. It will be observed that I have not given the extra weights of the various foods that they have been fed. I made it a practice to be governed by judgment without the assistance of scales when feeding sheep for show. One exception occurred in 1892, when a pen of wethers was being prepared for exhibition that fall. Desiring to make all the circumstances as favorable as possible for winning some important prizes with this pen, Professor Craig was consulted as to the proper selection of foods to make a good ration. The following was submitted: three pounds clover hay, one-half pound oats, one-half pound oil cake, one-fourth pound corn, one-fourth pound wheat. It may be mentioned that the nutritive ratio of this is about 1 : 5, which is considered a proper proportion for fattening sheep. The feeding of this gave excellent results, and it contributed in a large degree to the merits of the pen of wethers that were the champions at the Chicago Fat Stock Show in 1892.

Use of jackets. — Jackets should always be used after early shearing, as they will help to improve the fleece in point of cleanliness and firmness. The best material to use is strong muslin or light sailcloth. The jackets should extend along the body and completely cover the sides. The ends that meet in front of the bosom should be sewed together and an opening should be left for the sheep's neck and

head. To keep the jacket from sliding forward, a loop should be made to pass under the tail and the hind flanks.

Washing before trimming. — With the exception of Southdowns, all sheep should be washed before they are trimmed. It is not advisable to wash sheep of any breed more than twice. Always choose a bright forenoon for washing, so as to lessen the possibility of a chill. Soft soap and water rather slightly tepid may be used freely, and the rinsing done afterwards with clean water. A week should elapse between the washing and trimming of ewes to give the wool time to set. If trimmed before this, it is likely that holes will be left in the fleece, and these will be difficult to remove.

Stubble shearing. — Blocking the sheep out of the old wool is often done, but it is usually unsatisfactory in results. A discriminating judge detects it readily and generally renders judgment, discouraging the practice in the show ring. This deception may be easily discovered and should at once be condemned by the judge. The old wool that has been left on the sheep is clearly shown by its dark gray color.

Trimming. — This preparation has for its aim the smoothening of the sheep's fleece and the hiding of any defects in its form. The fleece of the Down breeds supplies the best material for the trimmer's art; hence it reaches the greatest perfection amongst breeders of such sheep. It is very necessary that

the trimmer thoroughly understands the model of the breed he is preparing for exhibition, and knowing this, he must clearly adhere to it as a pattern for the sheep he is treating. In starting to trim, the belly wool should be leveled first. This is necessary so that the wool on the sheep's back may not be roughened after it is trimmed. When trimming the belly, also pare the feet. In trimming, always dampen the wool, so that no shear marks will be observable. Begin the work by letting the sheep stand in a perfectly natural position when held by an assistant; then proceed to cut the tail head and carry the line straight along the back. This is done by reducing any elevation in the outline and leaving the hollows untouched. In treating the sides, commence at the shoulders and work gradually downward to the belly. Be content with giving the desired shape in the first trimming, and as the wool grows take the opportunity to give the final shaping and smoothening. Always be careful to work the shears backwards on the same region, so as to remove the slightest shear mark. After finishing the body, shape the head, neck, and bosom in a similar manner.

Carding fleece. — After the sheep has been trimmed into the desired form, and before much smoothening has been done, it is a good plan to take a fine wire-toothed comb and tear the fleece in such a manner as to leave it in a much rougher plight than it was before the work was commenced. By

Fig. 52. — (Page 273.)

Fig. 53. — (Page 273.)

Plate XXII. Carding the Fleece before Trimming.

this means all floss is pulled to the surface, and after the sheep is again trimmed, the coat is smooth and it will keep so for months. In the work of trimming, a strong open brush is of much assistance. It may be employed to much advantage in dampening the fleece as well as in bringing the irregular fibers to the surface. A damp piece of flannel may be used to excellent advantage by rubbing the fleece with it, as it assists in removing the loose fibers and also in cleansing the fleece.

In Figs. 52, 53, Pl. XXII, the loose ends and uneven parts of the dampened fleece have been brought out. In this case, an ordinary currycomb is being used, though the card is preferable. In Fig. 54, Pl. XXIII, the back is being leveled, and the sides trimmed in Fig. 55.

Frequency of trimming. — After the first trimming, the sheep should be trimmed once a fortnight until the work is complete. Within a week or so of the exhibition, the final trimming should be given, and the last light trimming just previous to the time for the show.

Oiling the fleece. — During the trimming, the fleece of the sheep should be oiled slightly, and this should be repeated before starting on the show circuit. It is best accomplished by taking a wine glass of olive oil to one-half an ordinary pail of water. The water should be heated to 100° Fahrenheit, as the oil globules disperse much better in warm water.

Stir the mixture well, then with the hand apply the liquid over the body and back of the sheep, patting the fleece with the palm of the hand until the wool has a soft, silky feeling. One dressing will usually prove sufficient. A light jacket should be placed on the sheep at once to prevent dust adhering to the wool after it has been oiled.

Firming the fleece. — Flat board pressure is often used on medium-wooled sheep to level and compress the wool on their backs. It assists in making the fleece appear level and mellow, yet firm to the touch. A limber piece of board about the size of an ordinary shingle is excellent for this purpose. The sheep is gently beaten over all parts, especially on the back, with the board, and special care is taken not to overlook any part of the body.

Trimming long-wooled sheep. — Although trimming is not so noticeable in the sheep of the long-wooled breeds, it is extensively practiced. When I left Great Britain in 1865, the Border Leicesters were clipped and trimmed with care. In those days, stubble shearing was much resorted to in these breeds, but latterly it has been prohibited. The Lincolns, Cheviots, and Cotswolds at that time underwent treatment by smearing with ocher, and they also were trimmed.

Treatment of long-wooled fleeces. — The fleeces of the long-wooled breeds may be greatly improved by prudent trimming and the use of soft soap and water.

When the wool is deficient in crimp in these breeds, this feature may be produced artificially by the application of sour milk that has not reached the curdled stage to the fleece when it is dry. Sour milk has long been used for this purpose. When ten years of age, I learned it from my father's shepherd, Thomas Logan, who stated that his father, shepherd to the famous Culley in Northumberland, had taught it to him.

Process of felting. — Another method of improving the fleece of show sheep consists of felting the wool with hot irons. First reduce the wool on the backs of the sheep to the desired length, bearing in mind the shorter the wool, the more satisfactory will be the handling. Previous to felting the wool, it should be slightly oiled, and a clean cloth spread over the sheep's back. A hot iron is now applied in the same manner as in ironing cloth. It is astonishing how the felting or ironing process improves the fineness of the fleeces of some sheep, while they at the same time retain the elasticity sought for by the judge. It is especially effective in imparting these qualities to fleeces that are light yet fine in quality.

Coloring. — This is the art of staining the wool on the sheep so as to improve the appearance of the animal. It is quite generally practiced by exhibitors in Great Britain, but has not been followed to any great extent in this country. There are various ways of applying it. Some shepherds use a syringe

or a sprinkler, others put it on by hand, and many brush the coloring into the wool or dust it in by use of a large pepper box. In brushing it into the fleece, the touch should be light, and in using the pepper box, care should be taken to note that the dry powder does not come out too freely.

Material used for coloring. — The substances used for coloring medium-wooled sheep are usually red and yellow ocher, burned umber, or insect powder at certain seasons. They may be used in solution or applied in a semiliquid condition with water or oil. The latter application may be objected to because it forms a crust and makes a surface of the wool hard to trim. It has been my practice to use the pepper box and apply a mixture of yellow ocher and burnt umber. It should be used lightly, thereby giving a natural tint to the wool. In using a pepper box, it is necessary to observe that the wool is very dry; otherwise, if the coloring matter drops too heavily on any spot, it makes an unsightly blemish that cannot be blended with the rest. Another system of coloring medium-wooled sheep consists in the application of lamp black and palm oil. It should be rubbed on gently with the palm of the hand, care being taken not to make the application too dark. An emulsion of Irish moss and olive oil is also excellent dressing for Southdowns. Steep the moss for two hours, and in mixing it, proportion the oil so that none of it will rise to the top. When mixed in proper

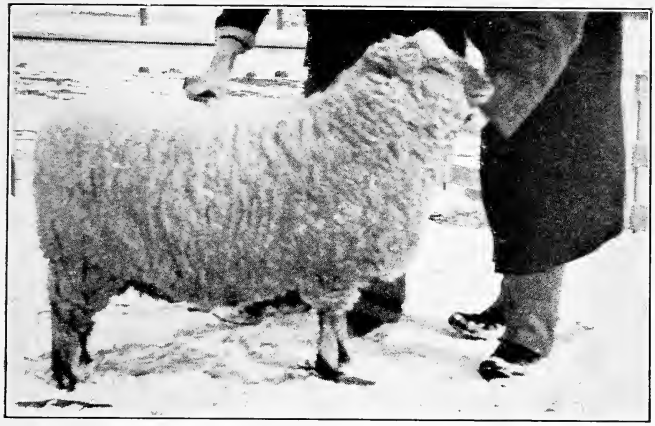


FIG. 54. — Leveling the back. (Page 273.)

FIG. 55. — Trimming the sides. (Page 273.)

PLATE XXIII. LEVELING AND TRIMMING THE FLEECE.

proportions, these ingredients form a soft paste which is easily applied to the fleece. It is advisable for a beginner to make his first trial of these methods on a sheep that is not intended for show. The practice of trimming and coloring, when carried to excess, should be condemned. It may be said that it is legitimate to improve the fleece as far as it is possible to do so without altering the natural form of the sheep, but by means of oiling and coloring serious defects in the fleece are changed into excellencies, and gross deception originates. It is hoped by the writer that this explanation of these practices will speedily assist their curtailment.

After-treatment of show sheep. — When breeding sheep return from the shows, their after-treatment is a matter of much consideration. The aim should be to reduce them in flesh by means of easy exercise and not by any marked reduction of their rations. A few hours' exercise each day will soon strengthen them so that they will be able to remain out continually. In some cases in which the fattening has been carried to extremes, it may be necessary when the sheep return to give them a mild purge. As a rule, exercise with a limited reduction of the grain ration will be sufficient to bring them back to normal condition. In reducing the fleshiness of the sheep, it is necessary to watch their progress closely; for it becomes a very hard matter to restore them if they are permitted to become too low in condition.

CHAPTER XV

DISEASES

KEEPING in mind that this manual is designed for flockowners the majority of whom have no technical medical knowledge, only such ailments and disorders will be discussed as the intelligent flockmaster can detect from descriptions, and treat, when treatment is practical, with a reasonable degree of success. The deeply hidden and complicated constitutional disorders will be left for special medical works.

Parasitism. — Sheep suffer to a far greater extent from parasites than all other ailments combined. Could the external and internal parasites of sheep be annihilated, sheep and their owners would have nearly all their troubles removed. The sheep more than any other domestic animal suffers from internal parasites. There are two invading the lungs, two the stomach, a half-dozen the intestine, one the liver, and two, in the cyst form, the brain.

Gid, turn-sickness, or sturdy. — The cysts invading the brain and accredited with producing gid are a transitional form of a tapeworm which in its adult stage is found in the dog and other canine species. The symptoms of this ailment are nervous twitching

about the head, an unnatural elevation and tossing of the head to one side, pressing against racks or other obstacles, or moving in a circle. In advanced stages, the affected sheep falls over and with head thrown back it struggles until death relieves it.

I do not consider any treatment, either surgical or medicinal, of any practical benefit, although I am familiar with the oft-advised surgical operation of trephining. As the trouble is purely a local one in the brain and certainly in the earliest stages in no wise affects the general health, the flesh is not unfitted for human food, and the wise thing is to slaughter the animal so affected at the first symptoms of the ailment.

The preventive treatment suggested by the accepted life history of the tapeworm is to keep dogs and other canines off sheep pastures or to treat them frequently enough to keep them free from adult worms. This is comparatively easy both because of the small number of dogs and the ease of treating them. A standard remedy is one dram of extract of male shield fern, given in a small amount of milk. The dog should first be fasted for twelve hours, and within two hours after the administration of the medicine, be given an ounce of castor oil. This should be allowed to act before any solid food is given. It is recommended to repeat this treatment once a month until a complete eradication of the tapeworm is effected. Of course, marauding dogs must be kept

off the pastures. A long-range gun is a fairly efficient means of doing this.

Tapeworms of the sheep. — There are two tapeworms which in their adult form inhabit the intestines of sheep. The outward symptoms are the same with either. In fact, the symptoms from the presence of tapeworms so nearly resemble those resulting from invasions of stomach with other intestinal worms that it is not easy to distinguish between them. A postmortem examination only insures a correct diagnosis. The symptoms resulting from any internal parasitic invasion are those of general debility, loss of condition, paleness of skin and mucous membranes, and finally great weakness. However, lambs occasionally die from stomach worms without any of these symptoms in marked degree. A few minor symptoms may assist the expert shepherd in determining the presence of the larger and more common tapeworm, *tænia expansa.* Sheep suffering from its presence have an abnormal appetite. Segments of the worm may at times be found in the excrement, and in long-suffering cases diarrhea may prevail. This latter symptom, however, may result from other intestinal worms. Upon postmortem, this tapeworm will be found in the small intestine. Not infrequently there will be several, each several feet long. When it seems certain that individuals are harboring this particular tapeworm, treatment may be given with a reasonable degree of success. Several remedies

have been recommended. Those given in the form of a drench are more efficient than solids, as the latter are apt to pass into the first stomach. An efficient remedy is two drams of extract of male shield fern administered in a half cup of milk, and followed in two hours by four ounces of castor oil. This is the dose for mature sheep. Lambs should be given correspondingly smaller doses.

The second tapeworm, *tænia fimbriata*, is much smaller, not exceeding six inches in length. Yet it is a really more damaging parasite, as it often plugs the biliary duct. On account of its location, it cannot be reached by medicine, so that all remedial treatment is in vain. The only rational course to pursue with a flock suffering from invasion of this parasite is to send all that can be gotten into suitable condition to the market. The preventive treatment is the same as for all intestinal worms given in the following paragraph.

Intestinal roundworms. — There are several of these, but as they usually appear together and the method of infection and nature of external symptoms are the same, there is no reason for treating of them separately or even naming them, except to call attention to a specific symptom of one species, that producing nodular disease, or "knotty gut," as it is generally known. The life history has not been generally worked out, but from the vast number in comparatively young sheep, it seems probable that

they multiply within the sheep. The nodular disease is due to the invasion of the wall of the intestine by the embryo of a worm that in its adult form lives in the passage of the intestine. It may be possible by the persistent use of worm medicine to dislodge the mature worm, but nothing can be done to remove the nodules. This, as other of the intestinal worms, is communicated from one sheep to another through the medium of the pastures. As the little lambs begin to graze after their mothers, they pick up the eggs, or young, expelled in the excrement of the old sheep. Unless it is established that these parasites of the sheep live from year to year outside the sheep, it will be comparatively easy to grow a flock free from them by raising the lambs in the winter and never allowing them to follow old sheep upon the pastures. It is a safeguard to have cultivated crops, as rape, rye, oats, and peas, and even new seedings of timothy and clover, for the ewes and lambs. Frequent changing of the flock from one field to another is also a safeguard from infection of the lamb. Have two pastures, or better three, for each flock and leave them in each pasture but one week at a time.

Medicinal preventives. — A very large number of proprietary medicines has been offered flock-owners as remedies for internal parasites. Doubtless each of them contains one or more vermifuges, but they are usually mixed with so much other material and are sold at such high prices, compared

with the cost of well-known vermicides, that their use is hardly to be recommended. Moreover, their value is greater as a preventive than as a cure. They retard the development of worms when fed regularly, after the lambs have begun to graze, more effectively than they remove the worms after a serious infection. The invasion of the lambs by all internal parasites commences very soon after they begin grazing with old sheep upon pastures favorable to their transmission. It was formerly thought to be by way of surface water, but it is certain the invasion of lambs may take place upon perfectly dry pastures and in a dry season. Lambs, however, are troubled more in wet years, but because of their lower vitality rather than on account of the greater invasion of parasites.

Medicines that have proved of value as preventives are tobacco, copperas, turpentine, and blue vitriol. The former three may be fed in connection with salt. Use one pound of salt to four pounds of tobacco leaves, equal weights of salt and copperas, or salt saturated with turpentine. These may be kept before the flock all the time. The blue vitriol is best administered in solution, one dram to each sheep. This has proved a valuable remedy in advanced cases of stomach-worm invasion. Gasoline in one- to three-dram doses administered with milk has also proved a valuable remedy.

The stomach worm. — If any one worm is the cause of more deaths than any other, it is the twisted

stomach worm, so called because of its resemblance to a barber pole. It invades the fourth stomach and may easily be seen with the naked eye either floating in the watery contents or attached to the wall. The symptoms and treatment are the same as given above for intestinal roundworms.

It should be understood that whenever even one lamb in a flock is known to be invaded by any of these parasites that it is strongly probable that many, if not all, both old and young, are infested. The old sheep do not show the symptoms to the same extent as the lambs, simply because of their greater vitality.

Lungworms, hoose, husk. — Worms in the lungs are not as common as stomach and intestinal worms, yet are not infrequently found. Usually the same animals are harboring the stomach and intestinal worms. The same general symptoms of emaciation are manifest as in all cases of internal parasites: paleness of skin and mucous membranes and great weakness. The only distinguishing symptoms that evidences the presence of the lungworm is a low, husky cough, from which the name husk or hoose arises. There is no successful means of removing lungworm, but persistent administration of turpentine will prevent its multiplication, and high feeding will fit many of an affected flock for slaughter. The presence of the lungworm, so long as the sheep can be gotten fat enough to slaughter, does not deleteriously

affect the flock; hence the best disposition to make of it is to send the flock to market. The worms are communicated to lambs through the medium of the grass and first pass to the stomach. It is while the young are in the stomach that they may be destroyed by medicine, the same as prescribed for stomach and intestinal worms.

Grub in the head. — One of the bugbears of many flockowners is the grub of the gadfly. The fly is somewhat smaller than the blowfly and moves so rapidly as almost to elude detection. During midsummer it harasses the flock by darting into the nostril and depositing the minute grubs. These crawl up the nostril to the end of the passages and attach themselves to the mucous membrane. There they pass one stage of their development. During this period, they do not seriously injure nor are they a serious annoyance to their host. It is only when they have reached their stage of development for changing their habitat, and begin to move about, that they annoy the sheep. The sheep then sneezes violently, rears upon its hind feet, and appears in great distress. Its distress, however, is not as great as its behavior would indicate. The grub really does no injury. On the other hand, I do not think, as some have contended, that it is beneficial. But I am sure there is no call for any attempt to dislodge the grub. Any treatment with that end in view, such as pouring turpentine or coal oil into the nostrils, is

far more annoying to the sheep than the presence of the grub. I do not think they ever burrow into the brain, as many flockowners believe. Although they are very common, I doubt whether they ever kill a sheep. I have seen over twenty in the base of the horns of an old Merino ram that was dehorned, and he showed no annoyance from their presence whatever. It is probable, however, that they are one cause of catarrh.

Catarrh. — This is one of the unpleasant ailments, but is not a primary disease and is not to be treated directly. Chronic cases usually indicate a low state of vitality. Open-wooled sheep that are exposed to rains and are compelled to lie on cold, damp ground suffer most from it. The English breeds transplanted to this country are far more subject to it than Merinos. Acute cases may arise from confinement in ill-ventilated stables or exposure to a single storm. Good care and feeding is the best treatment in either case. However, tonics, as ginger, gentian, and copperas, may be used with good effect.

Dysentery, scours. — This is another of the secondary ailments; that is, it is a result, rather than a disease in itself, usually, of a digestive disturbance. Sudden changes of pasture or feed and overeating cause temporary derangement, though it may be severe enough to cause death. Frequently lambs or even mature sheep turned upon rank fall pasture after a long fast in a stockyard or on railway cars

suffer violently in this way. Here prevention is far better than any cure. Sheep or lambs shipped long distances should first be given dry feed and very cautiously turned upon rank pastures. When overeating of pasture is the cause, laudanum in tablespoonful doses for mature sheep, less for lambs, is a standard remedy. This should be administered with milk or water. A teaspoonful of ginger in a cup of warm water is also beneficial and should be resorted to whenever there is failing appetite. If the scouring is a result of overeating of grain, withholding all feed for twenty-four hours is good treatment. If the scouring persists longer, the use of laudanum should be resorted to. When scouring is due to the presence of intestinal worms, the first step in the treatment is to remove the worms by means of the remedies prescribed under the discussion of intestinal parasites. There is also an infectious dysentery that is to be treated by the use of antiseptics. Tablespoonful doses of some of the coal-tar antiseptics given at intervals of six hours will prove effective.

Constipation, stretches. — This is the reverse digestive disturbance due to long confinement to a dry ration with little variety. Sheep confined to timothy hay, straw, or corn fodder, with corn only for grain, suffer in this way, especially pregnant ewes. The stretching is a symptom of constipation. The remedy is a physic of salts or oil followed by a change

of diet and a stomach tonic. Wheat bran seasoned with salt and ginger is good. If any green feed, silage, or roots are available, use them and give the sheep access to salt and water.

Colic. — Sheep occasionally suffer with colic. It is due to derangement of digestion and should be so treated. Determine the cause of the disorder and remove it. As a temporary relief, a teaspoonful of ginger administered with a quart of water as warm as the animal can take it is beneficial. It is rarely serious unless accompanied by bloating. This is due to an acid condition of the stomach. In such cases, an alkali should be administered. A tablespoonful of soda in warm water will usually give relief. In extreme cases, a trocar or knife should be used to remove the gas. This is a comparatively safe operation on the sheep. The puncture should be made on the left side between the last rib and point of hip.

Abortion, slinking. — This is not uncommon in isolated cases as the result of injury or fright. Such instances need cause no alarm, and call for no special treatment when the afterbirth comes away promptly. In cases of delayed expulsion of the lamb bed, it should be removed. This can usually be done by flushing the womb with warm water. The water should have been boiled and allowed to cool to the proper temperature and have some good antiseptic added.

Contagious abortion, however, does appear in flocks. Whether it is related to the same trouble among cows is not known, but is doubtless of the same nature, infectious, and should be so treated. Individuals not affected should be removed to a clean stable and every precaution taken to prevent the spread of the infection to them. Ewes so affected should not be bred again, and there is great danger that the ram used with the flock is infected. He should certainly be used with only a few ewes the first year as a test.

Eversion of uterus, casting withers. — This is a displacement of the womb with protrusion of the neck. It is due to a weakness of the sustaining ligaments. It usually precedes yeaning, but may persist afterwards. Treatment is necessary or the sufferer will sooner or later die. If the animal is in proper condition and not too far advanced in pregnancy, she may be slaughtered. As a temporary relief, the protruding parts should be thoroughly cleansed with a mild solution of alum water and replaced. To do this, cover the compressed fingers with a clean, soft cloth and press gently but firmly upon the protruding organ. It is helpful to lay the ewe upon her back and elevate the hind parts. The organ is easily returned, but not so easily retained in place. To prevent the ewe from expelling it again, place her in a narrow stall with hind feet much elevated. Tying a cord tightly about the flank and

loin is some restraint. As a last resort, take two or three stitches through the lips of the vulva. In case of pregnant ewes, watchfulness must be exercised to remove them before parturition. Rarely is a permanent cure of this trouble effected. Such ewes should not be retained in the breeding flock.

Garget, caked udder. — There are different forms of this trouble, arising from different causes: congestion with milk, chilling or bruising of udder, and infection. The latter is by far the most serious. In such cases, seldom if ever can the affected udder be saved. Treatment should be given, however, to save the life of the animal. Inject through the teat a saturated solution of boric acid and apply a sharp blister. Give the patient a mild physic and protect against unfavorable weather condition. As soon as an abscess forms in the udder, open it, so as to give free drainage, and wash out frequently with the boric acid solution. In the milder forms of garget, carefully draw all milk and apply tincture of belladonna or tincture of iodine or carbolized oil and heat with a saucer kept warm in a vessel of hot water. This treatment should be persisted in until recovery is effected. Feed very lightly until inflammation has subsided. A complete recovery may be expected in these cases.

White dysentery in lambs. — This is an infectious trouble and generally fatal. It attacks lambs a few hours or at most only a few days old. Thus far pre-

ventive treatment has been more effective than remedial. As soon as the disease appears, remove all ewes that have not yeaned to a clean stable, thoroughly disinfect their udders and keep the floor of the new stable freshly bedded. It is a wise precaution also to sprinkle the stable floor frequently with a good disinfectant. Lambs that die with this trouble should be buried deeply or burned, and the stable thoroughly disinfected before other lambs are allowed to be born in it.

Joint-ill. — This is an infectious trouble. Infection enters through the navel soon after birth. Remedial treatment is of little value. Whenever one case appears, it should be taken as a warning that the stable is infected. Thorough cleansing of the stable or bandaging each lamb as born so as to protect it against infection is the only safeguard. If the season is far enough advanced to make outdoor yeaning safe, turn the flock upon the pasture and keep all the newly born lambs away from the infected stable.

Lamb cholera. — This malady is sometimes a very fatal scourge in flocks, and its cause is not yet known. It attacks lambs six to ten weeks old. They may be in stables or on pasture. The only constant condition that I have discovered is that it attacks only fat lambs. But not all fat lambs by any means are attacked. The lamb dies in a spasm, usually so soon after the attack as to escape notice. The

only treatment I have ever found that saved a lamb once attacked was heroic bleeding, and that has not always been effective. Feeding ewes lime or bicarbonate of soda has been heralded as a preventive by some, but I have known heavy losses in flocks to which these have been fed, while others not so treated escaped any loss. I know of no preventive except scanty feeding of the ewe, and no reliable cure. I recommend bleeding. Cut off the tail, if it has not already been done, or open the vein on the inside of the fore leg by making a slit lengthwise in it and pressing the finger upon the vein between opening and the heart to force the flow of blood. A half pint may be drawn from an eight weeks' old lamb.

Calculi, gravel. — Mature rams that are highly fed, also young lambs, occasionally suffer from an accumulation of lime granules in the urethra, usually at the double curve where the retractor muscle attaches. This is just above the rear attachment of the scrotum. Careful manipulation with old rams may effect movement of the calculi so that they will pass out, though usually a surgical operation is necessary. The calculi should be located, then an incision made lengthwise of the urethra directly over the obstruction and as small as its removal will permit. If skillfully performed, and with antiseptic precautions, recovery may be expected in a fair proportion of cases. Recovery is more certain when the opening can be made in such a position that the

urine will not readily escape through the incision. With animals not especially valuable, the wisest course is to slaughter at once. If done before the general health is affected, the flesh will not be unfit for food. This trouble not infrequently affects highly fed winter lambs. They stand with arched back, appear stiff in hind quarters, and urine dribbles from them. In cases in which lambs were too small for market, I have cut the urethra off just above the scrotum and drawn the end out through the skin, letting the urine escape in this way until the lamb was large enough to slaughter. Occasionally calculi gather at the end of the penis of old rams. These are more easily removed. Sometimes shearers cut the long hairs that protrude from the urinal vent. The stubs then grow into the tissues and produce an annoying sore. Usually careful examination will suggest the treatment necessary.

Entropia, sore eyes. — Lambs are born, frequently, especially Merinos, with one or both eyelids turned under so that the lashes irritate the eye. In a very few days, the eye shows inflammation and the cheek below the eye will be wet. It is usually the lower lid. The trouble is easily remedied by taking a shallow stitch in the skin near the edge of the offending eyelid and then in the skin of the cheek an inch below, and tying the thread so as to hold the lashes away from the eye. Usually nothing further is necessary. The stitch will cut its way out within a few days and

the lid will take a normal position, and the irritated eye recover.

Pink eye. — Sheep suffer from infectious sore eyes similar to an infection of horses and cattle. Whether it is communicable from one species to another is not yet determined. Most cases yield to mild antiseptic washes, such as one per cent solutions of the coal-tar antiseptics. Affected animals should be kept confined in dark stables, and away from other sheep, so as to prevent the spread of the ailment. Care should be taken also not to feed the affected animals dusty hay, as the dust would aggravate the inflammation. Burned alum blown into the eye is an effective remedy when the ailment has advanced to a stage where a film covers the eye.

Goiter. — This is an enlargement of the thyroid gland. It is a result of improper feeding of the dam. There is no remedial treatment except a surgical removal of the gland. More skill and technical knowledge than the average flockmaster has is necessary for the operation. Lambs so affected should be sent to market as early as they can be fitted, as in the vast majority of cases the goiter enlarges with advancing age. To prevent its appearance, pregnant ewes should have plenty of outdoor exercise and be fed a well-balanced ration.

External parasites. — The external parasites from which sheep suffer annoyance are ticks, lice, scab mites, and maggots of the blowfly.

The scab. — This is produced by a minute insect, acarus, that burrows into the skin, causing great irritation. The suffering animal digs itself with its hind feet or rubs against some object until the skin is lacerated. The scab that develops at such spots gives name to the ailment. The mite is so small as not to be seen on the sheep, but may be seen as a minute speck on white paper. The cause of the ailment is now thoroughly understood and effective remedies known. The ailment yields readily to any one of the several dips: a decoction of tobacco stems; lime and sulphur, such as is now widely used for spraying trees; a solution of coal-tar products widely advertised for the purpose; also a sulphur and arsenic compound.

Fortunately, scab is pretty well eradicated from American flocks, especially in eastern states, though not entirely so. Flocks contract it only through contact with affected animals, or with objects against which they have rubbed. Any appearance of the ailment should be promptly treated. The writer once purchased some feeding lambs from New Mexico late in the fall. They were dipped under government inspection, but the scab broke out during the winter. I used crude petroleum freely on all affected points, rubbing it in thoroughly with a stiff brush. This held it in abeyance until the weather became warm enough to warrant dipping. The entire flock was disposed of in the spring. The following winter,

other sheep were placed in the same stable, and no further appearance of the ailment was seen.

The tick. — Ticks, to the discredit of flockowners, are still very common and are the cause of great loss not directly through death, but by interfering with the thrift of the animals. As with the scab mite, there is no excuse for permitting them to annoy the flock. They yield readily to the same treatment as the scab mite. A second dipping will be necessary to catch those that were in the egg stage at the time of the first dipping. Ten days should intervene between the two.

Sheep lice. — The sheep louse is less common than the tick, yet is occasionally found, especially upon goats. It is much smaller than the tick, but large enough to be seen with the naked eye. The same dips recommended for the tick will eradicate the louse.

Maggots. — These are the larval form of the blow-fly. They are a serious annoyance and cause of loss during the hot summer months, especially among flocks suffering from any hoof ailment. They also annoy rams or any other sheep with sores or with offensive odor about them. A sheep once invaded by them needs prompt and persistent attention, or it will soon succumb. Eggs will hatch within twenty-four hours, and when flies have once gotten after a sheep, they persist in depositing eggs upon it until it succumbs. Flocks so annoyed should be removed to a new field. The removal is best made

after night, so that the flies will not follow. Infested animals should be removed to a dark stable. Gasoline is an effective and economical remedy for destroying the maggots, and air-slacked lime sprinkled over the infected point is the best guard against further deposits of eggs. Turpentine and tar have been much used for this purpose, but are not as valuable as the gasoline and lime.

Aphtha. — This is an affection of the lips. Unless treated, it spreads to the lining of the mouth, over the face, and may appear upon the feet and legs. It first appears as small, red, and slightly elevated spots upon the lips. Later, watery vesicles appear. After they burst, scabs develop. It is frequently seen on nursing lambs. It will then also be found upon the teats and udders of their mothers. It yields somewhat readily to antiseptic treatment. Use a carbolic ointment, or if scabs have formed, soften them with a two per cent solution of some of the carbolic dips. Persist in this treatment until a cure is effected. When the teats of nursing ewes are affected, use a dressing of boric acid with eight parts lard, as the odor of carbolic acid will prevent lambs from nursing. It may be necessary to hand-milk the ewes and feed the lambs for a few days.

Wool-pulling. — During the winter, in flocks that are highly fed on corn, there will be individuals that pull the wool from their sides, giving the flock a very ragged appearance, and causing no inconsiderable

loss of wool. In such cases, there will be found to be small eruptions on the skin. Change the diet to a more laxative and nitrogenous one and rub mercurial ointment into the skin at the affected points. The trouble will disappear when the flock goes to pasture. Another cause of loss of wool is lying upon heating manure. Still another cause is parturient fever. The treatment in both these cases is to remove the cause.

Cotted wool. — Felting of the fleece is the result of some constitutional disturbance, that checks the natural flow of oil, thereby allowing the fibers to felt. Any serious ill health that reduces the condition of the sheep may be the cause. The only remedy is to restore the sheep to good health. The trouble may not appear another year.

Administration of medicines. — Medicines should never be administered through the nose. Fluid medicines that it is desired should pass directly to the fourth stomach should be administered with the sheep standing. Secure a long, slender-necked bottle and a funnel that will fit it; a graduated measuring glass should also be provided. Let the sheep to be treated back into a corner. Step astride of it and with the left hand under the lower jaw elevate the mouth just enough so that medicine will run toward the throat. Insert the bottle in the side of the mouth, taking care not to pour into the mouth at once more than the animal can easily swallow. Fatalities have resulted from gasoline passing into the lungs.

INDEX

Abortion, 288.
Administration of medicines, 298.
Advantages in sheep-farming, 6.
After-birth, removal of, 189.
Age, how to tell, 165.
Alfalfa, 209, 250.
Altitude,
  classification based on, 29, 32.
  influence of, 30, 35.
American sheep-breeding, 40, 42.
Ancestry of present-day sheep, 23.
Aphtha, 297.
Autumn management of flock, 163.

Bakewell, Robert, 50, 52, 57, 153.
Barley for fattening, 249.
Barns, cost of, 15.
Black-faced Highland, 134.
Black Top Spanish Merino, 44.
Border Leicester, 57.
Bran for fattening, 248.
Breeding, importance of, for show sheep, 263.
Breeding ewes,
  age of, 164.
  grain for, 180.
  in early winter, 177.
  roughages for, 179.
Breeds,
  adaptability of, 33, 138.
  British breeds, 49.
  classification of, 28, 29, 32.
  formation of, 28, 32.
Breed type, 139.
Buildings,
  for early lambs, 238.
  for sheep farms, 13.
Butchering early lambs, 236.
Buying sheep to fatten, 259.

Caked udder, 290.
Calculi, 292.
Carding the fleece, 273.
Casting of withers, 289.
Castration, 199.
Catarrh, 286.
Cheviot, 131.
Cholera in lambs, 291.
Classification of breeds, 28, 29, 32.
Climate, influence on wool, 37.
Clover hay, 250, 251.
Colic, 288.
Combining wool and mutton, 3, 12.
Conditions for sheep, 1.
Constipation, 287.
Corn fodder, 180.
Corn for fattening, 247.
Corn stover, 250, 251.
Cotswold, 61, 73.
Cotted wool, 298.
Cross-breeding, 160.

Delaine Merinos, 44.
Dickinson Merinos, 44.
Dipping, 216, 295, 296.
  tank, 216.
Diseases, 278.
Docking, 201.
Dorset, 127, 230.
Dysentery, 286.
  white dysentery in lambs, 290.

Early lamb-raising,
  buildings for, 238.
  butchering, 236.
  feeding early lambs, 234.
  management at mating, 231.
  marketing, 235.
  markets, 238.

Early lamb-raising, shipping, 237.
the breeding flock, 230.
weight of, 229.
Ellman, 77, 153.
Entropia, 293.
Equipment for sheep farms, 11.
Eversion of uterus, 289.
Ewe flock, uniformity in, 145.
Ewes,
age for breeding, 164.
condition of, 177.
culling, 158, 163.
division for wintering, 183.
dry, 194.
feeding while suckling, 198.
flushing, 168.
grain for, 180.
marking bred, 174.
number to ram, 173.
ova produced by, 171.
silage for, 179, 180, 252.
sorting, 163.
time for mating, 167.
yearling, 167.

Farms for sheep, 11.
Fattening sheep, 240.
Feeding,
breeding ewes, 198.
early lambs, 234.
quantity to feed, 257.
show sheep, 264, 265, 266, 268, 269.
systems of, 256.
Feed racks, 16.
troughs, 16.
Fencing, 19.
Fleece,
carding, 272.
coloring, 275.
examining, 221.
firming, 274.
oiling, 273.
treatment of long wool, 274.
trimming, 271.
tying, 215.
weights, etc., 223.
Floor space, 14.
for early lamb-raising, 238.
Flushing ewes, 168.

Foundation stock,
pure breds *versus* grades, 135.
selection of, 137.

Garget, 290.
Gid, 278.
Goiter, 296.
Gravel, 292.
Grazing crops, 206.
Green crops, 5.
Grub in head, 285.

Habits of sheep, 21.
Hampshire sheep, 105.
Hand-breeding, 174.
Hoose, 284.
Hot-house lambs, 229.
weight of, 229 (see Early lamb-raising).
Husk, 284.

Imported sheep, popularity of, 149.
Improvement of flock,
in America, 174.
opportunities for, 147.
In-breeding, 153.
Increase while fattening, cost and value of, 258.
Intensive farming, sheep for, 4.

Judging sheep, 141.

Lambing,
assisting, 190.
delayed, 184.
indications of, 184.
Lambs,
attention at birth, 190.
castration, 199.
cholera, 291.
developing, 159.
docking, 201.
dysentery in, 290.
early (see Early lamb-raising).
feeding previous to weaning, 197.
hand-feeding, 195.
hot-house, 229.
marking, 191.
quantity of grain for, 197.

Lambs, still-born, 189.
  weak, 193.
  weaning, 209.
Lands for sheep, 3, 12, 13, 4.
Leicester sheep, 51, 54.
Lice, 296.
Lincoln sheep, 67, 73.
Line-breeding, 153.
  principles of, 155.
Lowland breeds, differences in, 73.
Lungworms, 284.

Maggots, 296.
Management, essentials in, 257.
Market grades of wool, 223.
Marketing early lambs, 235.
Markets for early lambs, 238.
Mating, time of, 167.
Medicinal preventives, 282.
Medicines, administration of, 298.
Merinos, 20, 25, 34, 42.
  classes of, 44.
  French, 46.

Oats for fattening, 247.
Ova produced by ewes, 171.
Oxford Down, 117.

Parasites,
  external, 291.
  internal, 278.
Pastures,
  changing, 205.
  shade in, 204.
Pasturing sheep with horses, 263.
Peas for fattening, 248.
Pedigrees, study of, 150.
Pink eye, 294.
Pregnancy, duration of, 183.
Preparation of show sheep, 262.
Preventives, medicinal, 282.
Pulled wool, 228.
Pulling wool, 297.

Racks for feeding, 16.
Rambouillets, 46, 47.
Rams,
  judging breeding qualities, 148.
  number of ewes for, 173.
  rations for, 181.
Rams, selection of, 147.
  testing, 151.
Ranching, 2.
Rape, 6, 207, 253, 254.
Roughages for sheep, 5.
  for ewes, 178.
  for fattening, 249, 250, 251.

Saxony Merinos, 27.
Scab, 295.
Scours, 286.
Shade, 12, 204.
  in pastures, 204, 254.
Shearing,
  before fattening, 255.
  in October, 256.
  manner of, 213.
  stubble, 271.
  time for, 212.
Shepherds, 6.
Shipping early lambs, 237.
Show sheep,
  after treatment, 277.
  feeding, 264, 265.
  fleeces of, 271.
  importance of breeding, 263.
  matching, 263.
  time of birth, 263.
  trimming, 271, 273.
Shrinkage of wool, 223.
Shropshire sheep, 86.
Silage, for ewes, 179, 180, 252.
Slinking, 288.
Soil, influence on wool, 39.
Sore eyes, 293.
Sorghum hay, 252.
Southdown, 74.
Soy beans, for fattening, 249.
Spring management of flock, 183.
Stomach worms, 283.
Stretches, 287.
Stubble shearing, 271.
Sturdy, 278.
Suffolk, 126.
Sugar beets, 180.
Summer management of flock, 202.

Tank for dipping, 217.
Tapeworms, 280.

Tar, 204.
Ticks, 296.
Trimming,
  deception due to, 142.
  frequency of, 273.
Troughs for feeding, 16.
  for watering, 18, 203.
Tunis sheep, 230.
Turn sickness, 278.
Twins, care of, 194.

Unmerchantable wool, 228.
Uterus, eversion of, 289.

Watering-troughs, 18, 203.
Webb, work of, 79.
Weeds, eaten by sheep, 7.
Weight of early lambs, 229.
Wheat for fattening, 249.
Winter management of flock, 175.
Withers, casting of, 289.
Wool,
  affected by altitude, 37.
  affected by climate, 37.
  affected by soil, 39.
  as a basis of classification, 28, 29, 32.
  combined with mutton, 3, 12.
  cotted, 298.
  density of, 219.
  market grades, 223.
  pulled, 228.
  shrinkage, 223.
  territory, 39.
  twine for, 215.
  unmerchantable, 228.
Worms,
  guarding against, 205.
  intestinal roundworms, 281.
  lung, 284.
  stomach, 283.
  tape, 280.

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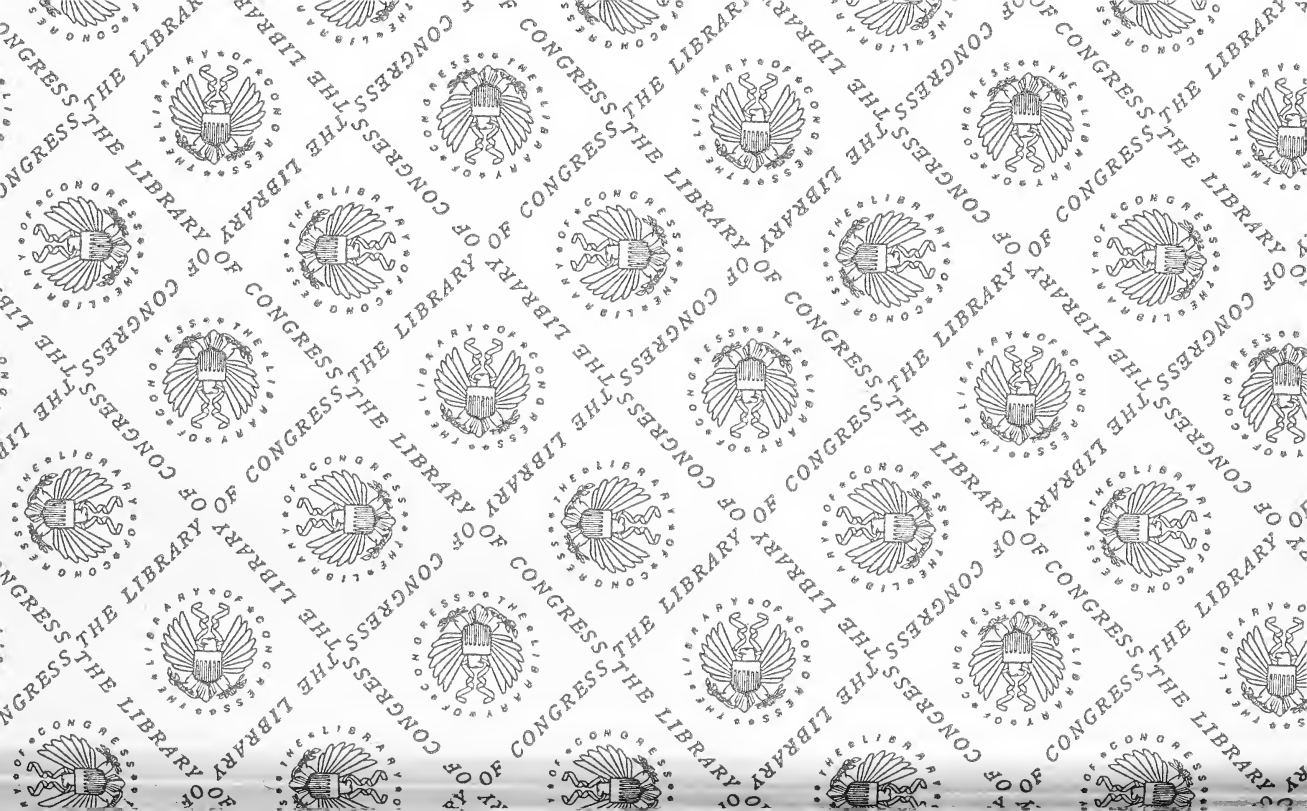
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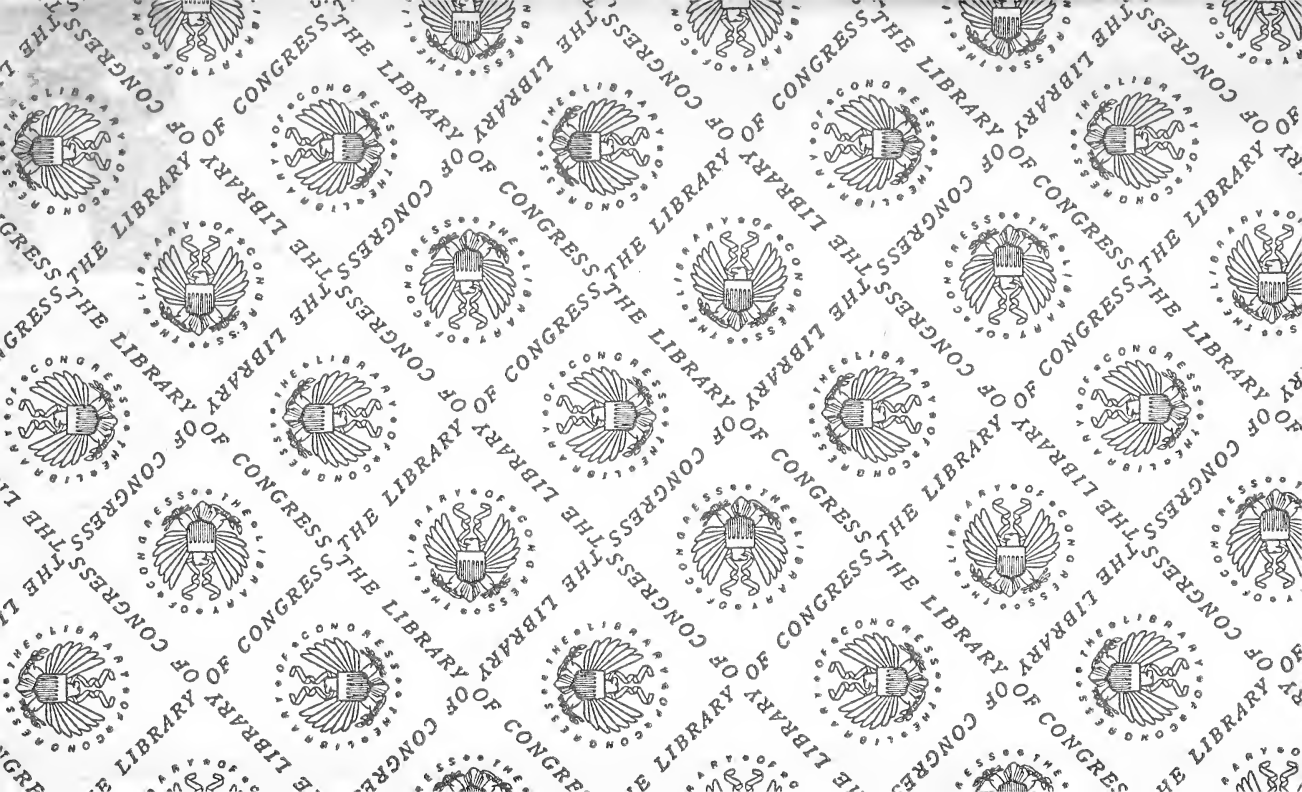
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